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DEPARTMENT OF
**Conservation
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Conserving the nature of WA



Cover

Nuytsia floribunda (Labill.) R. Br. ex Fenzl (Loranthaceae) – the Western Australian Christmas Tree is one of the few arborescent mistletoes in the world. This endemic tree is a semi-parasite common in sandy soil from the Murchison River to Israelite Bay. The journal is named after the plant, which in turn commemorates Pieter Nuijts, an ambassador of the Dutch East India Company, who in 1627 accompanied the “Gulde Zeepard” on one of the first explorations along the south coast of Australia.

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Conserving the nature of WA

CONTENTS

Page

Main papers

<i>Eucalyptus globata</i> subsp. <i>perata</i> (Myrtaceae), a new taxon from southern Western Australia and notes on <i>E. series Rufispermae</i> . By M.I.H. Brooker and A.V. Slee	157
New species and lectotypifications of some reticulate-nerved <i>Tephrosia</i> (Fabaceae) from north-west Australia and the genus <i>Paratephrosia</i> re-evaluated. By I.D. Cowie	163
<i>Grevillea bipinnatifida</i> subsp. <i>pagna</i> (Proteaceae), a new subspecies from south-west Western Australia. By R.J. Cranfield	187
Lichen Census of Western Australia. By R.J. Cranfield	193
Two new species of <i>Ptilotus</i> (Amaranthaceae) from Western Australia. By R.W. Davis	221
<i>Eucalyptus virginea</i> and <i>E. relicta</i> (Myrtaceae), two new rare forest trees from south-western Australia allied to <i>E. lane-poolei</i> , and a new phantom hybrid. By S.D. Hopper and G. Wardell-Johnson	227
A new species of <i>Bulbine</i> (Asphodelaceae) from Western Australia. By G.J. Keighery	241
A taxonomic review of the genus <i>Agrostocrinum</i> (Phormiaceae). By G.J. Keighery	245
Taxonomic notes on the <i>Angianthus drummondii</i> complex (Asteraceae : Gnaphaliinae). By G.J. Keighery	253
Taxonomy of the <i>Calytrix ecalycata</i> complex (Myrtaceae). By G.J. Keighery	261
Two new species of <i>Dampiera</i> (Goodeniaceae) from the Pilbara region, Western Australia. By B.J. Lepschi, M.E. Trudgen and S.J. van Leeuwen	269
A review of <i>Hibbertia hemignosta</i> and its allies (Dilleniaceae) from Western Australia. By J.R. Wheeler	277
Miscellaneous new <i>Hibbertia</i> species (Dilleniaceae) from the south coast and adjacent interior of Western Australia. By J.R. Wheeler	299
An interim key to the Western Australian species of <i>Hibbertia</i> (Dilleniaceae). By J.R. Wheeler	311

continued over

CONTENTS (*continued*)

Page

Short communications

Recognition of <i>Eucalyptus quaerenda</i> at specific rank. By M. Byrne	321
Correction of type locality and flowering time for <i>Melaleuca apostiba</i> (Myrtaceae). By M. Lewington	324
A first report of <i>Leptochloa panicea</i> subsp. <i>brachiata</i> (Poaceae) from Western Australia. By Neil Snow	325
Nomenclatural notes on two species of <i>Hibbertia</i> (Dilleniaceae). By J.R. Wheeler	327

Other contents

Corrections to Nuytsia Volume 15 Number 1	329
Conservation Codes for Western Australian Flora	330
Publication date for Nuytsia Volume 15 Number 1	330

Eucalyptus conglobata* subsp. *perata* (Myrtaceae), a new taxon from southern Western Australia and notes on *E.* series *Rufispermae

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Abstract

Brooker, M.I.H. and Slee, A.V. *Eucalyptus conglobata* subsp. *perata*, a new taxon from southern Western Australia and notes on *E.* series *Rufispermae*. *Nuytsia* 15(2): 157–162 (2004). A new taxon, *Eucalyptus conglobata* R. Br. ex Maiden subsp. *perata* Brooker & Slee, from southern Western Australia is described and illustrated. A distribution map for the typical and the new subspecies is provided. A brief discussion of the large *E.* series *Rufispermae* to which the species belongs is given.

Introduction

The *E.* series *Rufispermae* Maiden is one of the largest in the genus in terms of numbers of species. It was erected by Maiden (1925) and based on the single species *E. woodwardii* Maiden from east of Kalgoorlie. The species of the series are overwhelmingly southern in distribution with only *E. repullulans* Nicolle of the Pilbara occurring north of latitude 26°.

E. conglobata was originally published as a variety of *E. dumosa* in 1867 from specimens in South Australia. *E. dumosa* is now recognized to be an eastern endemic in New South Wales, Victoria, and South Australia possibly as far west as Eyre Peninsula. The var. *conglobata* was raised to specific status by Maiden in 1922 and its distribution recognised as extending to Western Australia. Field observations and herbarium specimens reveal that the far western form of *E. conglobata* is consistently smaller in adult leaf, flower bud and fruits, while recognizing that typical *E. conglobata* occurs east of Esperance in Western Australia.

***Eucalyptus conglobata* subsp. *perata* Brooker & Slee, subsp. nov.**

A subspecies typica foliis adultis (ad 10 cm x 2 cm) alabastris (ad 0.8 x 0.4 cm) fructibusque (ad 0.5 x 0.7 cm) minoribus et distributione *perata* differt. (Figures 1, 2, 3).

Typus: 14 miles (23.5 km) west of Hopetoun towards Hamersley River (Fitzgerald River National Park), 7 November 1969, M.I.H. Brooker 2312 (*holo*: CANB; *iso*: PERTH).

Mallee to 5 m tall. Forming a lignotuber. Bark smooth throughout, shedding in short strips, pale

grey over creamy white; branchlets with oil glands in the pith. Cotyledons reniform; seedling stems rounded or squared in cross-section; seedling and juvenile leaves always petiolate, opposite for 3 or 4 nodes then alternate, ovate to broadly lanceolate, 4-8 x 2-3 cm, dull, green to grey-green. Adult leaves alternate, petioles 1-2 cm long, blade lanceolate to narrowly lanceolate, 6.2-10 x 0.8-1.5(2) cm, base tapering to petiole, concolorous, usually slightly glossy, green, penniveined reticulation very dense, veinlets erose, intramarginal vein close to margin, oil glands intersectional. Inflorescences axillary unbranched, peduncles stout, 0.3-0.8 cm long, 7-flowered; buds closely sessile, crowded, ovoid to obovoid, 0.7-0.8 x 0.3-0.4 cm, scar present, operculum usually conical, striate, stamens inflexed, anthers cuneate, versatile, dorsifixed, dehiscing by longitudinal slits (non-confluent), style long, stigma blunt, locules 4(5), the placentae each with 4 vertical ovule rows; flowers white. Fruit sessile, tightly clustered, cupular, 0.4-0.5 x 0.5-0.7 cm, disc usually descending, valves 4(5), at rim level. Seed reddish and lustrous, 1.1-2.2 mm long, flattened-ovoid and often slightly angular in outline, dorsal surface shallowly reticulate, occasionally lacunose, hilum ventral.

Specimens examined. WESTERN AUSTRALIA: Fitzgerald River National Park, Hamersley Drive 14.1 km. S. of Old Ongerup Road, 9 Oct. 1984, *Briggs, B.G.* 7688 & *Johnson, L.A.S.* (CAN, NSW, PERTH); 3 km S by track of the Ravensthorpe-Esperance road, c.35 km E of Ravensthorpe (track turnoff is 5.7 km W of rabbit proof fence on main road), 20 Sep. 1978, *Briggs, J.D.* 275 (CANB); 14 mls W of Hopetoun, Hamersley Inlet, 7 Nov. 1969, *Brooker, M.I.H.* 2312 (CANB, PERTH); on plain leading to Woolbernup Hill, 6 Apr. 1974, *Brooker, M.I.H.* 4456 (CANB); 1.4 km SW of rail crossing near Bokal, SW of Arthur River, 17 Aug. 1979, *Brooker, M.I.H.* 6369 (CANB, NSW, PERTH); Toolibin North turnoff at Narrogin-Harrismith road, 4 May 1983, *Brooker, M.I.H.* 8098 (CANB); 6.4 km W of Quiss Road between Jerramungup and Ravensthorpe, (33° 54'27"S, 119°02'42"E), 29 Aug. 1998, *Brooker M.I.H.* 12916 & *Slee, A.V.* (AD, CANB, PERTH); 2 mls S of Peringillup, 11 Sep. 1947, *Burbidge, N.T.* 2437 (CANB); Oldfield River, 40.8 mls E of Ravensthorpe, 15 Mar. 1967, *Chippendale, G.M.* 196 (AD, CANB, MEL, NSW, PERTH); Bremer Bay Road, 10 Feb. 1970, *Demarz, H.* 2176 (CANB, Kings Park); Wishbone Railway Reserve, 12 km E of Dumbleyung, 10 Mar. 1984, *Fell, D.G.* 188 (CANB); Fitzgerald River NP; 5 km ENE of point where Moir Rd crosses Phillips River, c. 7.6 km SSW of Ravensthorpe, 9 Feb. 1986, *Fox, J.M.* 86/216 (CANB, MEL, PERTH); Wagin, *Gardner, C.A. s.n.* (CANB); 1.5 mls (c. 2.4 km) SE of Ravensthorpe, 22 Feb. 1966, *George, A.S.* 7574 & *Carr, S.G.M.* (AD, BRI, CANB, DNA, HO, MEL, NE, NSW); Kwobrup, 28 Sep. 1952, *Key, K.H.* 73689 & *Wallace* (CANB); 12 miles from Gnowangerup, towards Albany, 10 Oct. 1962, *Phillips, M.E. s.n.* (CANB); Stirling Ranges, Feb. 1963, *Rave, F.W. s.n.* (CBG 23071 in CANB); 15 mls W of Jerramungup, May 1969, *Rockel, B.A. s.n.* (CANB); 11 km E of Ravensthorpe on Highway 1, lower slopes of Ravensthorpe Range (33°35'26"S, 120°09'39"E), 14 Sep. 1999, *Slee, A.V.* 4247 (CANB).

CULTIVATED: seedlings of *Brooker* 2312 (the type) (CANB 443842); seedling, Glasshouse, Forest Research Institute, Yarralumla, ACT, FRI 18185, grown from seed of FRI 14524 (*Chippendale* 196), 27 Sep. 1967 (CANB); seedling, FRI glasshouse, Yarralumla, 13 Feb. 1970, *Eakin, R. s.n.* (CANB); seedling, FRI glasshouse, Yarralumla, ACT, 8 May 1969, *Highway, K. s.n.* (CANB).

Distribution and habitat. WESTERN AUSTRALIA: southern wheatbelt, coastal and subcoastal from west of Arthur River and Kojonup (Bokal), to east of Ravensthorpe.

Conservation status. Widespread and abundant. Occurs in Stirling Range and Fitzgerald River National Parks.

Flowering period. Autumn.

Etymology. From the Latin *peratus*, western, alluding to its occurrence in relation to the typical subspecies.

Discussion

Eucalyptus conglobata belongs to the now large *E. series Rufispermae* Maiden (1925) which is overwhelmingly southern Western Australian in distribution, while a few species occur in South Australia, Victoria and New South Wales. On publication the series was monotypic although several other species, now clearly belonging to the series, had been published at the time. The series name is derived from the appearance of the seeds which are unique in the genus, being rather flat, lustrous and ruby-red and hence are easily recognisable.

The type for the series, *E. woodwardii* Maiden (1910), is a rare species occurring east of Kalgoorlie. It is an extreme form for the series, having the largest buds and fruit and attractive yellow flowers. The other species are white-flowered. Overall, the species of the *E. series Rufispermae* are variable in habit and comprise tree, mallet and mallee taxa. Bark is smooth in most species although a few taxa are blackbutts. Decorticating bark is shed by long ribbons, which characteristically remain hanging from the branches.

Although Blakely (1934) referred to seed morphology in some taxonomic groups, e.g. bloodwoods and ghost gums, which he seems to have grouped haphazardly together with *E. series Corymbosae*, he apparently did not know or recognise the coherent nature of the *Rufispermae* seed type in assessing natural affinities between species. This assumption could be negated by the fact that his work was explicitly a key and not a classification. Nevertheless, from the majority of his species' groupings, the 'Key' can be interpreted as a classification, deriving primarily from assessment of anthers and secondarily on habit, bark, phyllotaxis, and inflorescence characters, but not on seeds. This is despite the fact that his mentor and colleague, Maiden (1929), had earlier made a significant study of the seeds of many eucalypts and placed species into groups based on the similarity of their seeds. Blakely, however, in his preface, acknowledges that Maiden preferred the idea of a key based on cotyledons and 'primary leaves', which would clearly have had little applicability outside of the glasshouse.

Blakely (1934) appears to have ignored Maiden's series *Rufispermae* altogether and placed *E. woodwardii* with six other species in a new series *Obliquae* which was not typified. This series is now recognized to be heterogeneous. Based on characters other than the seeds, in accordance with his methodology (habit, bark, phyllotaxis, leaf shape, and inflorescences), Blakely erected the *E. series Dumosae*, based on *E. dumosa* A. Cunn. ex Oxley, an eastern taxon, and one of the few species of the series that he would have been familiar with, apart from herbarium or cultivated specimens. *E. series Dumosae* Blakely is also a heterogeneous grouping, although most of the species are recognized to belong to the higher taxon *E. section Dumaria* Pryor & Johnson ex Brooker (2000).

In 1988, Chippendale restored Maiden's series *Rufispermae* in the Flora of Australia Volume 19. He placed the series in contiguity with four other series, *Torquatae*, *Merrickianae*, *Tetrapterae* and *Ovulares* (if we exclude *E. series Dundasianae* which belongs in *E. section Bisectae*). Brooker (2000) grouped all the constituent species of these series, apart from *E. dundasii*, plus several published after 1988, into *E. section Dumaria*, comprising eleven taxonomic series.

E. conglobata subsp. *conglobata* occurs from lower Eyre Peninsula in South Australia west to about Esperance in Western Australia. It is usually a mallee, rarely a tree (Boston Island off Port Lincoln, D. Nicolle 1997). According to Chippendale (1988), syntypes for *E. conglobata* were collected at Port Lincoln (by C. Wilhelmi) and 'south coast' [S.A.] (by R. Brown). The mallees of this species (or trees) have more or less smooth bark, slightly glossy, green adult leaves (to 13 x 4 cm), and tightly clustered, sessile buds (to 1 x 0.7 cm) and fruits (to 0.8 x 1.2 cm) in 7s.

The typical subspecies has a much wider distribution than was known at the time of its publication and certainly extends to south-eastern, coastal Western Australia. The new subspecies occurs to the west of this distribution although there is a narrow zone in which the two taxa intergrade. It differs from the typical subspecies in the smaller adult leaves (to 10 x 2 cm), buds (to 0.8 x 0.4 cm), and fruits (to 0.5 x 0.7 cm), while its natural affinity is unmistakably with the typical subspecies. A comparison of the subspecies of *E. conglobata* and closely related taxa and also some that may be confused with it is given in Table 1.

Table 1. Comparison of mallee species closely related to *E. conglobata*.

Character	<i>E. conglobata</i> subsp. <i>conglobata</i>	<i>E. conglobata</i> subsp. <i>perata</i>	<i>E. phenax</i> subsp. <i>phenax</i>	<i>E. phenax</i> subsp. <i>compressa</i>	<i>E. dumosa</i>	<i>E. pileata</i>
Peduncle length cm	0–0.7	0.3–0.8	0.3–0.8	0.8–1.4	0.5–2	0.5–1.5
Pedicel	sessile	sessile	sessile to shortly pedicellate	sessile	sessile or pedicellate	pedicellate
Bud shape	ovoid to obovoid	ovoid to obovoid	cylindrical to ovoid	cylindrical to ovoid	cylindrical	cylindrical to ovoid or ±pyriform
Operculum shape	conical (rarely beaked or rounded)	conical (rarely beaked)	conical to rounded	conical to turban- shaped	conical to slightly beaked or turban- shaped	conical to rounded or turban- shaped
Fruit shape	cupular to hemispherical, compressed	cupular	cylindrical to cupular	cupular to cylindrical or barrel- shaped	cupular to cylindrical or barrel- shaped	cupular to obconical or shortly barrel-shaped
width	0.7–1.1	0.5–0.7	0.5–0.8	0.6–1	0.5–0.7	0.6–0.9
Adult leaf length cm	7–13	6.2–10	5–12	6–11	4.8–12	6.5–14
Adult leaf width cm	1.5–4	0.8–1.5(2)	0.8–2.8	1.5–3.5	0.8–2.5	0.7–2.5
Bark	smooth	smooth	smooth	smooth	may be rough on lower trunk	smooth

Chippendale (1973) commented on the “smaller budded, smaller-fruited mallee” from near Wagin east to Israelite Bay, although he made no formal taxonomic distinction in his ‘Eucalypts of the Western Australian Goldfields’. We consider that the distribution of this small-budded form does not extend as far east as Chippendale stated and that the typical form occurs from east of Esperance. Subspecies status is appropriate for the new taxon because of its relatively discrete geographic range and consistent, smaller bud and fruit dimensions. The typical subspecies is more variable in dimensions, particularly

in the Port Lincoln region, although the great majority of the mallees there have conspicuously larger leaves, buds and fruits than the new taxon.

It is instructive to compare closely two similar taxa shown above, which we believe to be convergent and widely disjunct. These are *E. conglobata* subsp. *perata* which can be distinguished most readily from the other, *E. phenax* subsp. *compressa*, by the stout peduncles 0.3 – 0.8 cm long (peduncles 0.8 – 1.4 cm in *E. phenax* subsp. *compressa*). *E. conglobata* subsp. *perata* also generally has narrower adult leaves (0.8 – 2 cm wide) and smaller fruit (0.5 – 0.7 cm wide) than *E. phenax* subsp. *compressa* (leaves 1.5 – 3.5 cm wide; fruit 0.6 – 1 cm wide). *E. conglobata* subsp. *perata* is a Western Australian endemic while *E. phenax* subsp. *compressa* is restricted to Kangaroo Island and the adjacent mainland of Fleurieu Peninsula in South Australia.

It is difficult to glean from herbarium data the site characteristics that the new taxon appears to prefer. Clays, loamy sand, sandy loam, sandy clay over granite, limestone and lateritic gravel are all given as substrate on labels. Associated eucalypts are *E. occidentalis* Endl., *E. redunca* Schau., *E. pleurocarpa* Schau., *E. oleosa* F. Muell. ex Miq. subsp. *corvina* L. Johnson & K. Hill, *E. lehmannii* Schau., *E. platypus* Hook., *E. uncinata* Turcz., and *E. leptocalyx* Blakely. These are known to occur on a range of sites from wet depressions, to clay and lateritic sands.

The *E. series Rufispermae* comprises over thirty species, many of which have been divided into subspecies. The series is one of the largest in the genus in terms of number of taxa and in distribution, which is probably why no comprehensive taxonomic revision has been undertaken. As well, it is likely that new taxa in the series will be found, e.g. on Eyre Peninsula and southern Western Australia.

A complicating feature of the series is that it is difficult to recognize infra-series taxa. Brooker (2000) lists the species only with affinities merely suggested, with no division into subseries, unlike the treatment of a similarly large series, viz. the *E. series Subulatae* (Brooker 2000).

In a recent publication, Hill, Johnson and Blaxell (2001) stated of the *E. series Rufispermae* (which they treated as *E. series Obtusiflorae*), “Further division into subseries is problematical”, and we are certainly in agreement with this assertion. However, to accommodate the species treated in their publication, Hill *et al.* tentatively recognized three complexes, viz. those based on *E. pileata*, *E. obtusiflora* and *E. kondininensis*. The complexes were not comprehensively described, emphasizing the difficulty of diagnosis in this area of *Eucalyptus* taxonomy. We suggest that *E. conglobata* would belong to the *E. pileata* complex of Hill *et al.*, but as stated earlier, the series requires a detailed revisionary treatment.

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Figure 1. Intact inflorescences showing flower buds of *E.conglobata* subsp. *conglobata* (top, Slee 4058) and *E.conglobata* subsp. *perata* (bottom, Brooker 12916).

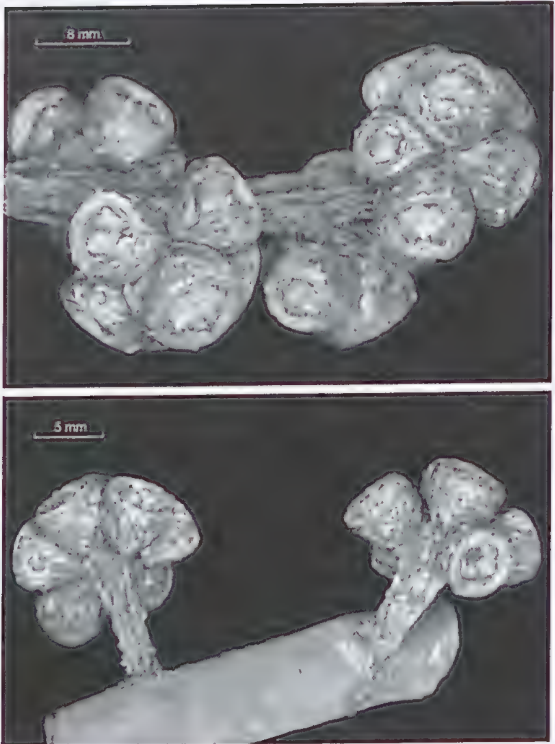


Figure 2. Intact inflorescences showing fruits of *E. conglobata* subsp. *conglobata* (top, Slee 4058) and *E. conglobata* subsp. *perata* (bottom, Brooker 12916).

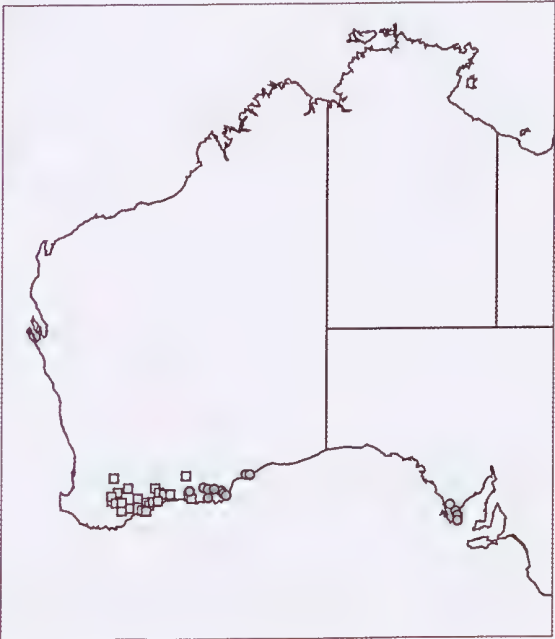


Figure 3. Distribution of *E. conglobata* subsp. *perata* □ and *E. conglobata* subsp. *conglobata* ○.

New species and lectotypifications of some reticulate-nerved *Tephrosia* (Fabaceae) from north-west Australia and the genus *Paratephrosia* re-evaluated

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Abstract

Cowie, I.D. New species and lectotypifications of some reticulate-nerved *Tephrosia* Pers. (Fabaceae) from north-west Australia and the genus *Paratephrosia* re-evaluated. *Nuytsia* 15 (2)163–186 (2004). Eight new species of reticulate-nerved *Tephrosia* are described from the Kimberley Region of Western Australia and the Northern Territory (*T. andrewii* Cowie, *Tephrosia bifacialis* Cowie, *T. carriemichelliae* Cowie, *T. ephippioides* Cowie, *T. gyropoda* Cowie, *T. humifusa* Cowie, *T. procera* Cowie, and *T. valleculata* Cowie). *Paratephrosia* is reduced to synonymy under *Tephrosia* and a new name, *Tephrosia lasiochlaena* Cowie, is published for *P. lanata*. Lectotypifications are provided for six reticulate-nerved and allied taxa of *Tephrosia* (*T. flammea* F. Muell. ex Benth., *T. nematophylla* F. Muell., *T. oblonga* R. Br. ex Benth., *T. polyzyga* F. Muell. ex Benth., *T. porrecta* R. Br. ex Benth. and *T. reticulata* R. Br. ex Benth.).

Introduction

Tephrosia Pers., is a pantropical genus of more than 400 species of herbs and shrubs (Geesink, 1981). In Australia, the genus occurs predominantly in the tropics and subtropics, generally growing in well-drained sites in open habitats. The most recent comprehensive treatment of the genus in Australia is that of Bentham (1864), who recognised 23 species. Since then additional species have been described by Mueller (1875, 1879, 1880, 1883), Domin (1912, 1926), Fitzgerald (1918) and more recently Pedley (1977), among others. Bosman & de Haas (1983) revised the genus for Malesia, with several species from that area also occurring in northern Australia. It is known that the genus contains a number of complexes requiring further investigation as well as many undescribed taxa. The present paper has been prepared to allow fuller descriptions of species and discussion of decisions prior to treatment in the Flora of Australia.

The genus is united by a suite of characters, many of which could be considered conservative. These include: the presence of only simple basifixed hairs; usually a lack of stipellae and bracteoles; flowers with bee pollination syndrome; a standard which is sericeous or pubescent on the outer surface and which lacks inflexed auricles; uniform anthers; and a simple, dehiscent pod with thinly coriaceous valves (Hutchinson, 1964; Geesink, 1984). As currently circumscribed, *Tephrosia* includes informal groups possibly endemic to Australia that are defined by leaf venation. In Australia, four basic venation types, with variations, can be distinguished in cleared leaves:

(i) species with parallel secondary veins extending to the margin, the intersecondary venation closely spaced and parallel to the secondaries but breaking up into a sparse, indistinct reticulum before reaching the margin (e.g. *T. phaeosperma* F. Muell. ex Benth.) grading into;

(ii) species with well spaced secondary veins extending to the margin, the intersecondary veins short to obscure and breaking up into a sparse, indistinct reticulum (e.g. *T. virens* Pedley). (Many orange flowered species in this group develop fine, short parallel striae on the cuticle of the leaflet undersurface on drying, although the cause of this has yet to be investigated.);

(iii) species with numerous closely spaced parallel secondary veins which dichotomise and anastomose submarginally, the intersecondary veins subparallel to secondaries and breaking up into a sparse, indistinct reticulum well before the margin (e.g. *T. macrocarpa* Benth.); and

(iv) species with well spaced secondary veins curving or dichotomising before the margin, the intersecondary venation often closely reticulate, prominent or not.

In addition, a number of yellow or orange flowered species with small or very narrow leaflets are difficult to place clearly in any of these groups (e.g. *T. arnhemica* White, *T. nematophylla* F. Muell., *T. simplicifolia* F. Muell ex Benth.). Whilst type (i) venation is apparently common in *Tephrosia* and some related genera in other parts of the world, the extent of occurrence of other venation types is not clear (Hutchinson, 1964; Gillett *et al.*, 1971; Bosman & de Haas, 1983; Geesink, 1984). The species described here belong to the fourth group, having reticulate intersecondary venation and usually orange flowers.

Flowers in the genus may be in pseudoracemes or only in axillary fascicles, with both inflorescence types occurring across the venation types. Corolla colour is in two basic groups corresponding partly with venation type and is either of the "purple" type including those from almost white through mauve and pink to dark red (corresponding to type (i) and type (ii) venation) or yellow to orange (corresponding to type (ii), (iii) and (iv) venation). The Australian orange and yellow flowered species usually have loose spongy or membranous tissue between the seeds (although not truly septate) and most have flattened, glabrous styles and penicillate stigmas. Pods are of two common types: (a) straight in the lower half and straight to slightly upcurved towards the apex, the beak in line with the upper margin, or (b) straight with a more or less central beak. In Australia, these pod types are found in all venation and flower colour types. Clearly, there is a need for further investigation of generic limits and infrageneric subdivisions.

Methods

This study was based primarily on the gross morphology of dried herbarium material supplemented by field observation of most species. Descriptions of flowers have been prepared primarily from rehydrated material and material preserved in Kew mixture, while other parts have been measured and described using dried material. A DELTA (Dallwitz 1980; Dallwitz *et al.* 1999) database of 112 characters was compiled and used to generate descriptions of each species. Photographs of type material located at K and BM were consulted, while types at BRI, MEL and DNA were either obtained on loan or consulted at those institutions. Definition of terms generally follows Stearn (1966). Distribution maps were prepared using ARCVIEW GIS 3.2 from locality data on herbarium specimen labels.

Taxonomy

Paratephrosia

Paratephrosia lanata (Benth.) Domin was originally described by Bentham (1864) in the genus *Lespedeza*, perhaps because of the woolly-tomentose indumentum, one-seeded pod, axillary flowers, 3-foliolate leaves with reticulate venation, and lack of hooked hairs. At the same time Bentham (1864) apparently overlooked the sericeous back and lack of inflexed auricles on the standard, the flattened style and the vexillary stamen which is free at the base and connate above, characters consistent with *Tephrosia* rather than *Lespedeza*. Domin (1912) transferred the species to a new monotypic genus, *Paratephrosia* Domin which he described as distinct from *Tephrosia* because of the dense indumentum, crowded, pinnately 3-foliolate leaves, reticulate venation, relatively long linear-subulate stipules and bracts, and flowers in axillary fascicles. Domin noted that while *Paratephrosia* agreed with the African genus *Requienia* in the uniovulate ovary it differed by the 3-foliolate leaves, strongly elongated calyx lobes and short calyx tube, but did not mention the reticulate leaflet venation in this instance. Geesink (1984) tentatively reduced *Paratephrosia* to synonymy under *Tephrosia*, pending a more detailed study of the Australian species and noting that the characters used to discriminate *Paratephrosia* are not rare in *Tephrosia*. Likewise, I argue here that *Paratephrosia* be reduced to synonymy under *Tephrosia*.

Almost all of the characters used by Domin (*loc. id.*) to segregate *Paratephrosia* are now known to be found in other species included in the genus *Tephrosia* as it is recognised in Australia (see below). Although the crowded fascicle-bearing leaves are unique to *Paratephrosia* and can give it a distinctive appearance, this is only through the reduction of the internodes and not through any basic structural difference. The stipules and bracts which Domin described as linear-subulate (apparently based only on the type) are quite variable in size and shape in this widespread species, ranging from 3–15 mm long and overlap with those of many other species. As discussed further below, reticulate venation is present in some 12 Australian species of *Tephrosia* previously named; trifoliolate leaves are commonly present in at least 16 species; 11 species can have flowers primarily in axillary fascicles and four species are predominantly uniovulate. Trifoliolate leaves, flowers in axillary fascicles and a uniovulate ovary all occur not just in reticulate-nerved species but also in some species with purple flowers and type (i) venation (e.g. *T. brachycarpa* F. Muell. ex Benth., *T. stuartii* Benth. and *T. leptoclada* Benth.).

Considering the situation more closely, there is a group of seven species appearing closest to *P. lanata*. This *Paratephrosia* group all have a similar dense, white to more or less ferrugineous, woolly indumentum, usually pinnately 1 or 3-foliolate leaves, broad leaflets, prominent reticulate venation, orange flowers in axillary fascicles and vexillary calyx lobes usually divided to the same depth as the lower three. Within this group, 4 species (*T. arenicola* Maconochie, *T. forrestiana* F. Muell., *Paratephrosia lanata* and *T. uniovulata* F. Muell.) are more closely united by the presence of usually one-seeded pods, although leaves may be only 1-foliolate, 1-foliolate and pinnately 3-foliolate or only pinnately 3-foliolate. *Paratephrosia* differs from these species primarily by the crowded fascicle-bearing leaves. The other three species, *Tephrosia andrewii*, Cowie *T. valleculata* Cowie and *T. carriemichelliae* share the indumentum, axillary flowers, leaves and reticulate venation of the *Paratephrosia* group but are 3–7-ovulate and have differing pods. In addition, *T. carriemichelliae* differs in having the vexillary calyx lobes partly connate above the calyx tube (as is the usual case in *Tephrosia*) and has 1-foliolate or apparently simple leaves whilst *T. andrewii* and *T. valleculata* are sometimes pinnately 5-foliolate. Also, *T. carriemichelliae* and *T. andrewii* both have terete styles while the style of *T. carriemichelliae* is also bearded - characters known from the genus in other parts of the world (Brummitt, 1980; Bosman & de Haas, 1983). Given the overlap of characters within this group, it does not seem feasible to maintain *Paratephrosia lanata* as distinct from it at generic level.

Enlarging the circumscription of *Paratephrosia* to include this *Paratephrosia* group can be considered. However, none of the characters of this group except the density of the indumentum is unique to it and there is a gradual transition to the remainder of *Tephrosia*. A large group of species has reticulate intersecondary venation, broad leaflets, almost always yellow or orange flowers and partly connate upper calyx lobes. For most of these species leaflet venation and subulate stipules are the only two of Domin's characters in common with *Paratephrosia sensu stricto*. Amongst these, the closest species to the *Paratephrosia* group is perhaps *T. coriacea* Benth., a species that is 1-foliolate or less often 3-foliolate, has broad leaflets with reticulate intersecondary venation, flowers in axillary fascicles, 4–7 ovules, but lacks the indumentum of the *Paratephrosia* group. A closely related undescribed taxon (known from a single fruiting collection) appears to differ from *T. coriacea* primarily by having a racemose inflorescence. Many species with racemose inflorescences have a few fascicles in the upper leaf axils whilst in *T. porrecta* R. Br. ex Benth., the fasciculate, axillary inflorescences grade into a pseudoraceme as the fascicle-bearing leaves diminish in leaflet number towards the branchlet apex. *Tephrosia lamproloboides* F. Muell., *T. humifusa* Cowie, and *T. bifacialis* Cowie are apparently close to *T. coriacea* and are 1–3-foliolate, have broad leaflets, and 4–12 ovules but have racemose inflorescences. The closest species to *T. bifacialis* and *T. lamproloboides* appear to be *T. varians* (Bailey) C. White (5-foliolate with 6–12 ovules) and *T. reticulata* R. Br. ex Benth. (with 7–11-foliolate leaves and 5–9 ovules). From here, there are a whole suite of species with an often sparse indumentum, many leaflets, reticulate venation, racemose inflorescences, orange flowers, partly connate upper calyx lobes, and more than 4 ovules. Among these *T. conspicua* W. Fitzg., *T. oblongata* R. Br. ex Benth. and *T. procera* Cowie, have broad leaflets while there are others with much smaller or narrower leaflets (e.g. *T. crocea* R. Br. ex Benth., *T. ephippioides* Cowie, *T. polyzyga* F. Muell. ex Benth., *T. porrecta* R. Br. ex Benth.).

At the time Domin described *Paratephrosia*, fewer species of *Tephrosia* were described and the genus may have seemed clearly distinct. However, in the intervening years more species have become known, with several closely related species described here. It can be seen that *Paratephrosia* fits into the continuum of characters in *Tephrosia* and on this basis *Paratephrosia* should be reduced to synonymy. A new name is needed for *Paratephrosia lanata* when placed in synonymy of *Tephrosia* since the epithet *lanata* is already occupied in the genus.

Tephrosia lasiochlaena* I.D. Cowie, *nom. nov.

Based on *Paratephrosia lanata* (Benth.) Domin *Repertorium Specierum Novarum Regni Vegetabilis* 11: 262 (1912). - *Lespedeza lanata* Benth. *Fl. Austral.* 2: 241 (1864), non *Tephrosia lanata* Mart. & Gal., *Bull. Acad. Roy. Soc. Bruxelles* x.II. 48. (1843). *Typus*: Mt Strzeleckie, [N.T.], J. McD. Stuart (*holo*: K, photo seen; *iso*: MEL!).

Etymology. The specific epithet is from the Greek, *lasios* - woolly and *chlaena* - a cloak or covering and refers to the thick woolly indumentum on the foliage, branchlets and calyx of the species.

Tephrosia andrewii* I.D. Cowie, *sp. nov.

Tephrosia uniovulatae affinis, a qua ovulis quatuor vel quinque; floribus distincte grandioribus, foliolo terminale comparate brevior, leguminibus longioribus et seminibus pluribus differt.

Typus: Great Northern Highway area, SSW of Broome [precise locality withheld], W.A., 6 Apr. 1993, A.A. Mitchell 3024 (*holo*: PERTH!; *iso*: CANB!, DNA!).

Shrub, ascending, multistemmed, perennial, to 0.8 m, rootstock not seen. Branchlets, leaf and inflorescence rachis densely hairy, hairs ascending and patent, white. *Leaves* simple to imparipinnate; stipules persistent, antrorse, subulate, 2–4 mm long, silvery to red brown; petiole or rachis 0–22 mm long to basal leaflets, 13 mm between leaflets, 3–12 mm to terminal leaflet, 0–37 mm long overall; stipellae absent; *leaflets* 1–5; discolorous; obovate to broadly cuneate, sometimes rhomboidal or suborbicular, flat, 15–31 mm long, 12–29 mm wide, 1–1.3 times as long as wide, larger towards apex; secondary veins in 6–7 pairs, intersecondary veins reticulate, upper surface moderately hairy, hairs ascending, hyaline, lower surface with raised veins, densely hairy, hairs ascending, white; base attenuate or cuneate, apex obtuse to occasionally retuse, mucro usually absent; terminal leaflet 1.1–1.2 times as long as laterals. *Inflorescence* fasciculate, axillary, to 15 mm long, fascicles well spaced, 2-flowered. *Bracts* caducous, antrorse, subulate, c. 3 mm long; pedicels c. 2 mm long; bracteoles present on pedicels. *Calyx* 9–11 mm long, densely hairy, hairs ascending, white; tube 2–3 mm long, shorter than lobes; lobes long attenuate, all more or less equal; vexillary lobes divided equally to lower three, free for c. 7 mm; lowest lobe 7–8 mm long. *Corolla* orange, standard 11–13 mm long, claw c. 2.5 mm long, blade subquadrate to almost transversely elliptic, slightly callused at base, apex rounded to retuse; wings c. 12 mm long, longer than keel, blade oblong; keel 10–11 mm long, glabrous. *Staminal tube* glabrous near fenestrae, fenestrae callused on margins; upper filament straight in lower half, thickening gradually towards base, glabrous. *Ovules* 4–5. *Style* terete, tapering, glabrous; stigma penicillate at base. *Fruit* a pod, narrowly oblong, straight, raised over seeds, 27–41 mm long, 6.5–7 mm wide, with loose, spongy tissue between seeds, white, densely hairy, hairs ascending, white; beak central, deflexed. *Seeds* 1–5 per pod, c. 7 mm between centres, smooth, whole coloured, pale brown, oblong to lenticular, c. 4.6 mm long; hilum central; aril absent. Fig. 1 (A–H).

Other Specimens Examined. WESTERN AUSTRALIA: between de Grey River and Lagrange Bay, 1879, A. Forrest & J. Charey s.n. (MEL); Thangoo Station, on Pt Headland road [precise locality withheld], 13 Oct. 1984, P. Foulkes 49 (PERTH); Great Northern Highway, SSW of Broome [precise locality withheld], 17 Aug. 1993, A.A. Mitchell 3269 (DNA, PERTH).

Distribution. Endemic to an area between Broome and Port Headland, W.A. Fig. 2C.

Habitat. Grows in pindan country, in shrubland on sandy soils.

Flowering and fruiting. Flowers Apr. & Oct.; fruits Apr. & Aug.

Conservation status. Conservation Code for Western Australian Flora: Priority One. This species is known from only a few collections and is not known to occur on any reserve. The size and extent of populations and existence of any threats to the species is not known and requires further investigation.

Etymology. This species is named in honour of Andrew A. Mitchell, botanist with the Australian Quarantine and Inspection Service, a diligent collector of *Tephrosia*, who also collected the type specimen.

Affinities. Most closely related to *T. uniovulata*, but differs in the ovary which is 4- or 5-ovulate (1(–2) in *T. uniovulata*), the distinctly larger flowers and ratio of terminal leaflet length to lateral leaflet length (1.1–1.2 vs 1.3–1.8 in *T. uniovulata*). Also closely allied to *T. lasiochlaena* but differing in the number of ovules (1 in *T. lasiochlaena*), broader leaflets and inflorescences. Also related to *T. carriemichelliae*, with differences elucidated under that species.

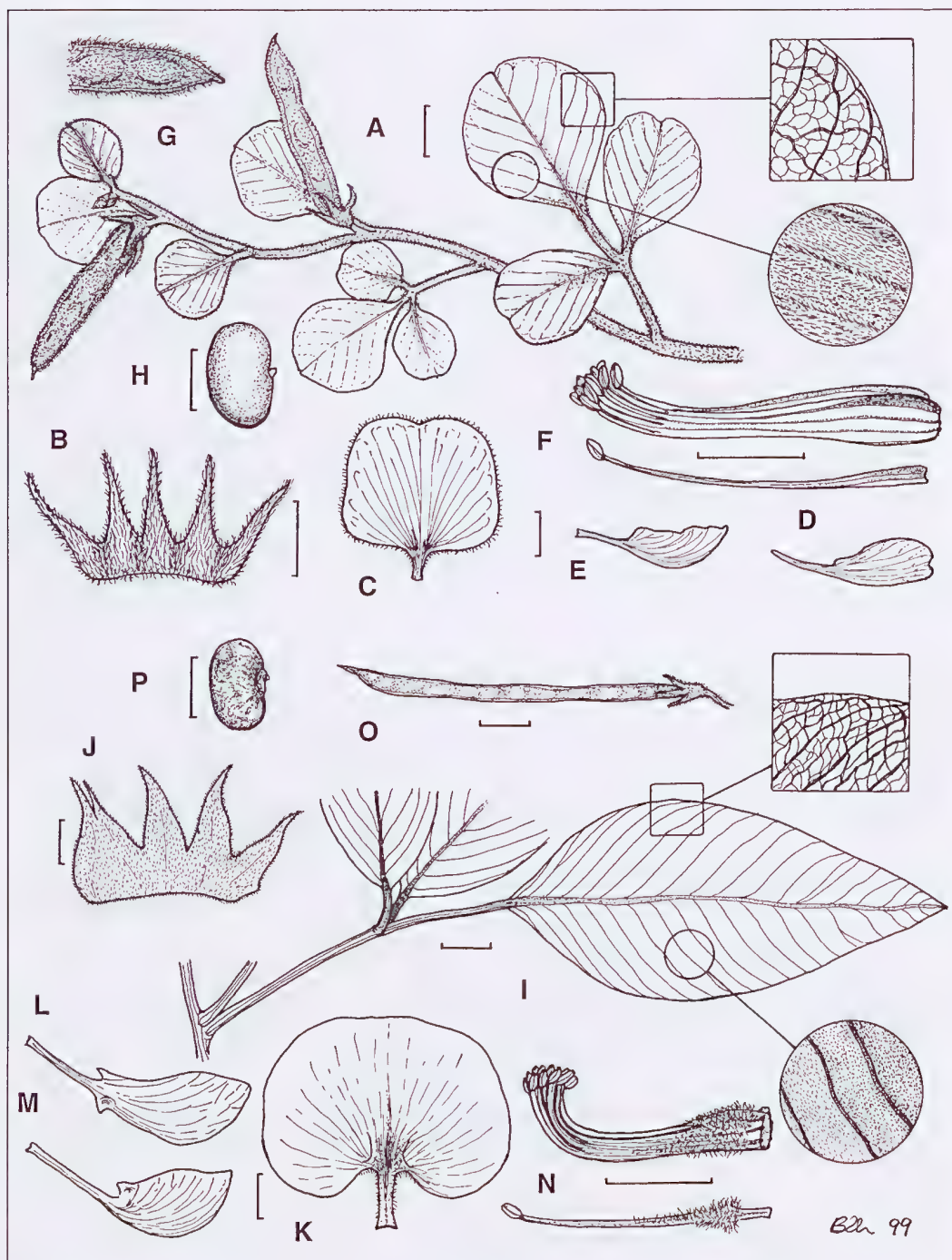


Figure 1. *Tephrosia andrewii*. A – habit showing details of venation and indumentum on leaflet undersurface, B – calyx (abaxial surface, vexillary lobes at LHS), C – standard, D – wing, E – keel, F – stamens, G – pod apex, H – seed. A – H from A.A. Mitchell 3024 (DNA). *Tephrosia procera*. I – leaf showing venation and indumentum on leaflet undersurface, J – calyx (abaxial surface, vexillary lobes at LHS), K – standard, L – wing, M – keel, N – stamens, O – pod, P – seed. I – N from G.J. Leach 2346 & C.R. Dunlop (DNA), O & P from I.D. Cowie 4182 (DNA). (A, I, O scale bar = 10 mm, others = 3 mm)

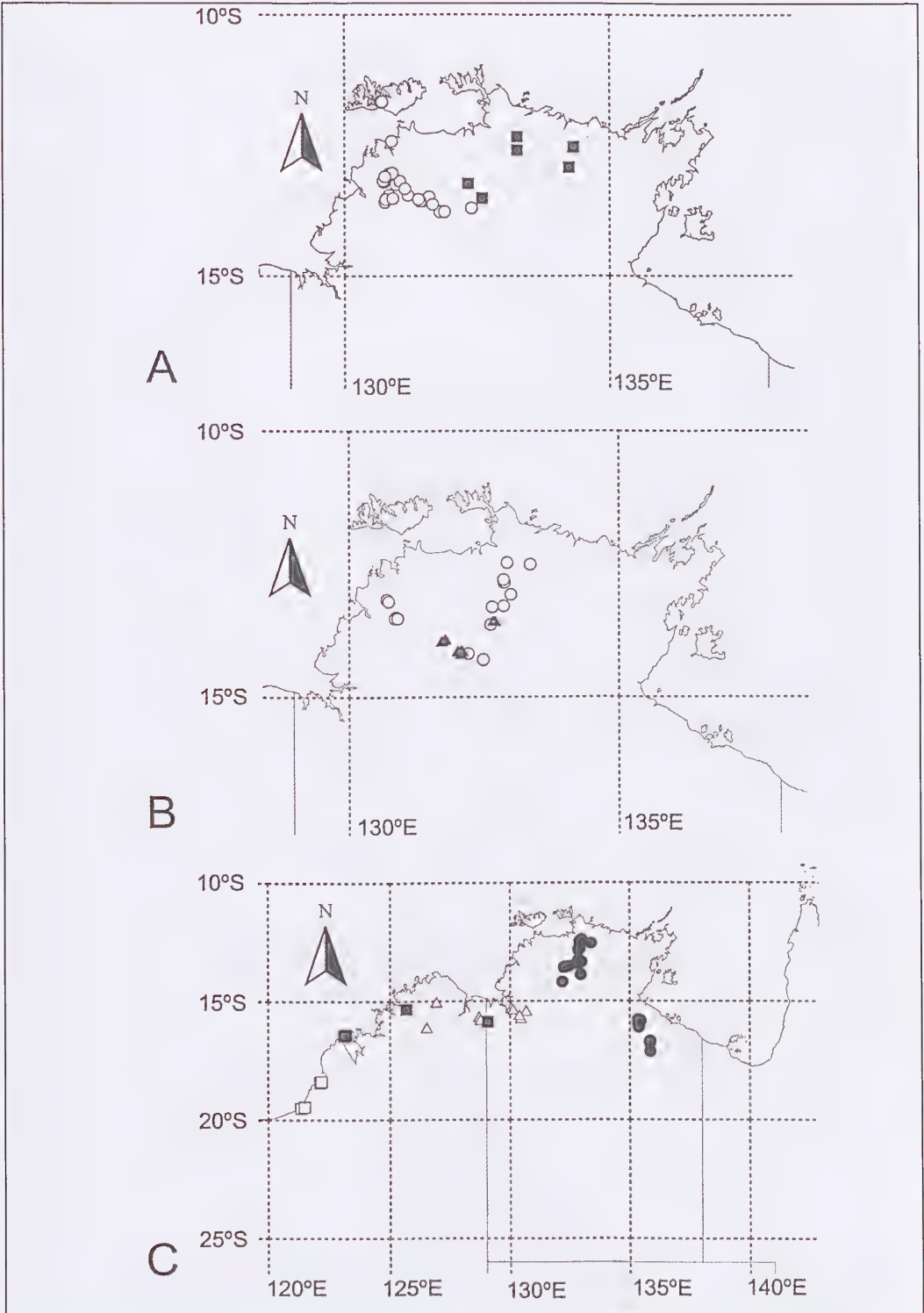


Figure 2. Geographic distribution of: A – *Tephrosia bifacialis* (○) and *T. humifusa* (■); B – *Tephrosia ephippioides* (○) and *T. carriemichelliae* (▲); C – *Tephrosia andrewii* (□), *T. gyropoda* (●), *T. procera* (△), and *T. valleculata* (■).

Tephrosia bifacialis I.D. Cowie, *sp. nov.*

A. T. lamproloboides foliis subsessilibus, foliolis 3, latioribus, valde discoloribus, prostratis differt.

Typus: Melville Island, Rd to Paru, NT, 21 Jan. 1991, *I.D. Cowie* 2181 & *G.J. Leach* (*holo*: DNA!; *iso*:BRI!, CANB!, K!, MEL!, MO!, NSW!, PERTH!).

Subshrub, prostrate, few-stemmed, perennial with annual aerial parts; taproot uniformly thickened. Branchlets, leaf and inflorescence rachis densely hairy, hairs ascending to patent, white to sometimes stramineous. *Leaves* digitately or pinnately 3-foliolate (rarely unifoliolate), ground hugging; stipules persistent, antrorse, attenuate, 3–6 mm long, dark brown; rachis 1–4 mm long to basal leaflets, 4–20 mm to terminal leaflet, 6–25 mm long overall; stipellae absent; *leaflets* (1)3; strongly discolorous; ovate to cuneate or suborbicular, flat, 24–97 mm long, 16–64 mm wide, 0.9–2.2(–2.7) times as long as wide; secondary veins in 10–18 pairs, intersecondary veins reticulate; upper surface glabrous, lower surface with prominently raised veins, densely hairy, hairs appressed or patent, white to stramineous, sometimes hoary; base rounded, apex obtuse to emarginate, sometimes apiculate, mucro absent or minute; terminal leaflet 1.3–1.7 times as long as laterals. *Inflorescence* racemose, ascending, terminal or axillary, to 0.5 m long, fascicles well spaced, 1–3-flowered. *Bracts* persistent, antrorse, attenuate, c. 4 mm long; pedicels 2–5 mm long; bracteoles present on pedicels. *Calyx* 4–9 mm long, densely hairy, hairs appressed to ascending, white; tube 2–3 mm long, equal to or shorter than lateral lobes; lobes attenuate to deltoid; vexillary lobes united higher than lower three, free for 1–3 mm; lowest lobe 1.5–6 mm long, distinctly longer than or sometimes equal to lateral lobes. *Corolla* orange or rarely yellow, standard 7–13 mm long, claw c. 1 mm long, blade subquadrate, calluses absent, apex emarginate to obcordate; wings 7–9.5 mm long, longer than keel, blade elliptic; keel 5–12 mm long, glabrous. *Staminal tube* hairy near fenestrae, fenestrae callused on margins; upper filament straight in lower half, callused near base, patent hairy. *Ovules* 6–12. *Style* flattened, uniform, glabrous; stigma penicillate at base. *Fruit* a pod, narrowly oblong, straight, compressed, 35–65 mm long, 6–7 mm wide, with loose, spongy tissue between seeds, white to pale brown, densely hairy, hairs ascending to patent, hyaline to white; beak central to eccentric, straight or slightly deflexed. *Seeds* 7–12 per pod, 4.5–6 mm between centres, smooth, whole coloured or mottled, olivaceous or black and pale brown, subglobular to oblong, 3–4.5 mm long; hilum central, or sometimes subapical; aril absent. Fig. 3 (J–Q).

Selected Specimens Examined. NORTHERN TERRITORY: Litchfield National Pk, 15 km WSW Adelaide River township, 13°15'55"S, 130°57'48"E, 5 Mar. 1996, *R. Booth* 1491 & *I.D. Cowie* (DNA); Blackfellow Creek, Daly River Road, 13°32'S 130°50'E, 14 Dec. 1966, *N. Byrnes* NB40 (DNA); 4.3 mls [6.9 km] NW of Pine Creek, 13°47'S, 131°47'E, 16 Mar. 1961, *G. Chippendale* NT7597 (DNA); 9 mls [14.4 km] S of Batchelor, 13°12'S, 131°02'E, 18 Mar. 1961, *G. Chippendale* NT7747 (DNA); Daly River Road, just N of Survey Creek, 13°36'S, 130°45'E, 11 Apr. 1993, *I.D. Cowie* 3841 (BRI, CANB, DNA); 12 km SSE of Adelaide River township, 13°20'48"S, 131°07'41"E, 26 Mar. 1994, *I.D. Cowie* 4631 (CANB, DNA, MEL); Litchfield National Pk, 13°03'29"S, 130°50'01"E, 14 Mar. 1995, *I.D. Cowie* 5267 & *S. Taylor* (BRI, CANB, DNA, MEL, NSW, PERTH); Litchfield National Pk, near Tableland Creek, 13°29'42"S, 130°51'19"E, 13 Feb. 1996, *I.D. Cowie* 6144 & *R. Booth* (BRI, DNA); Charles Darwin National Pk, 12°26'00"S, 130°52'50"E, 20 Feb. 1998, *R.K. Harwood* 306 (DNA); 70 mls [112 km] S of Darwin, Stuart Highway, 13°28'S, 130°50'E, 8 Aug. 1968, *P.K. Latz* 73 (DNA); Litchfield National Pk, road to Batchelor, 13°11'23"S, 130°43'7"E, 25 Nov. 1992, *G.J. Leach* 3358 (DNA); 3 km N of Hayes Creek, 13°30'S, 131°35'E, 5 Mar. 1978, *J.R. Maconochie* 2338 (AD, BRI, CANB, DNA, K, MEL, MO, NSW, NT, PERTH); Litchfield National Pk, 13°02'47"S, 130°53'22"E, 10 Feb. 1997, *C.R. Michell* 435 & *S. Calliss* (DNA); Hayes Creek area, 13°35'S, 131°25'E, 22 Mar. 1973, *J. Must* 1113 (BRI, CANB, DNA, K, L); Kakadu National Pk, Bloomfield Springs Track, c. 6 km W of Springs, 13°43'S 132°23'E, 27 Apr. 1990, *A.V. Slee* 2927 & *L.A. Craven* (DNA).

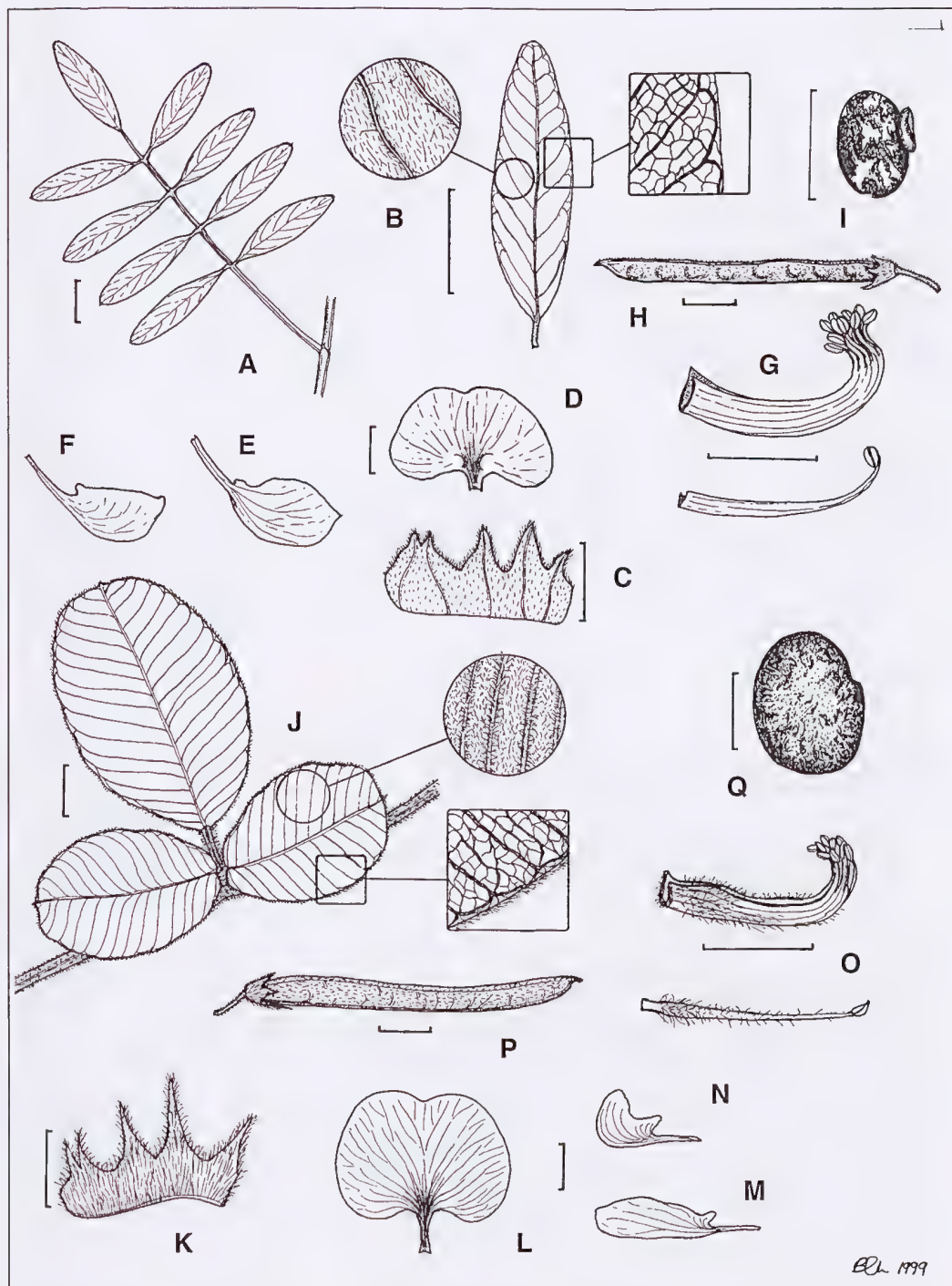


Figure 3. *Tephrosia gyropoda*. A – leaf, B – leaflet undersurface showing venation and indumentum, C – calyx (abaxial surface, vexillary lobes at LHS), D – standard, E – wing, F – keel, G – stamens, H – pod, I – seed. A – I from I.D. Cowie 8816 (DNA). *Tephrosia bifacialis*. J – leaf showing venation and indumentum on undersurface, K – calyx (abaxial surface, vexillary lobes at LHS), L – standard, M – wing, N – keel, O – stamens, P – pod, Q – seed. All from I.D. Cowie 2181 (DNA). (A, B, H, J, P scale bar = 10 mm, others = 3 mm).

Distribution. Endemic to north western N.T. between Melville Island in the north, Daly River in the south west and southern Kakadu National Pk in the south east. Fig. 2A.

Habitat. Grows in *Eucalyptus* woodland, usually on stony soils, often with impeded internal drainage.

Flowering and fruiting. Flowers Nov. to Apr.; fruits Dec. to Apr.

Conservation status. No special conservation coding is recommended. The species is well represented in Litchfield National Pk and is at least known to occur in Kakadu National Pk. In much of its range it is relatively common in suitable habitat and is not considered threatened.

Etymology. The specific epithet is from the Latin *bi* meaning two and *facialis*, meaning facial and refers to the strongly discoloured leaves of this species.

Affinities. The species forms part of a group comprising *T. lamproloboides* and *T. reticulata*. It differs from *T. lamproloboides* in the almost sessile 3-foliolate leaves with broad, strongly discoloured, ground-hugging leaflets (as opposed to narrower, apparently simple, petiolate leaves which are concolorous to weakly discoloured in *T. lamproloboides*). Leaves of *T. reticulata* usually have 7–11 distinctly smaller, oblong leaflets, with a distinct rachis below the basal leaflets. Two incomplete specimens from the central Kimberley with 5 leaflets (e.g. I.D. Cowie 4173) are tentatively placed with *T. reticulata*. Another related species is *T. humifusa* and differences are discussed under that species.

***Tephrosia carriemichelliae* I.D. Cowie, sp. nov.**

Species haec ab *T. andrewii* differt foliis simplicibus vel unifoliolis, grandioribus, calyce brevioribus lobis vexillaribus pro parte maxima connatis, carina secus marginem inferum pilifero, stylo pilifero secus laterem vexillare et leguminibus latioribus.

Typus: Yinberrie Hills, near Edith River, N.T. 25 January 1991, I.D. Cowie 1483 & C.R. Dunlop (holo: DNA!; iso: AD!, BRI!, CANB!, K!, L!, MEL!, MO!, NSW!, PERTH!, QRS!).

Subshrub, erect, multistemmed, perennial with annual aerial parts, to 0.5 m; rootstock unspecialised. Branchlets, leaf and inflorescence rachis very densely hairy, hairs ascending to patent, silvery. *Leaves* simple or unifoliolate; stipules persistent, antrorse, deltoid, 2–3 mm long, silvery; rachis to basal leaflet or petiole to 10 mm long; stipellae absent; *leaflets* concolorous; broadly ovate to transversely broadly elliptic, rarely obovate, flat, 40–70 mm long, 40–76 mm wide, 0.9–1.3 times as long as wide; secondary veins in 7–9 pairs, intersecondary veins reticulate, both surfaces densely hairy, hairs appressed to ascending, silvery; base rounded to cuneate, apex rounded to emarginate, mucro usually absent or rarely minute. *Inflorescence* fasciculate, axillary, c. 20 mm long, fascicles well spaced (rarely on a very short lateral axis), 2–4-flowered. *Bracts* caducous, antrorse, subulate, c. 2 mm long; pedicels 3–5 mm long; bracteoles usually absent. *Calyx* 7–9 mm long, densely hairy, hairs ascending, silvery; tube 3–4 mm long, equal to lateral lobes; lobes attenuate; vexillary lobes united higher than lower three, free for c. 1 mm; lowest lobe 4–9 mm long, distinctly longer than lateral lobes. *Corolla* orange, green in centre, standard c. 15 mm long, claw 2.5–3 mm long, blade transversely elliptic, calluses absent, apex rounded to emarginate; wings 13–14 mm long, equal to keel, blade oblanceolate; keel 13–14 mm long, appressed hairy along lower margin. *Staminal tube* glabrous near fenestrae, fenestrae callused on margins; upper filament straight in lower half, thickening gradually towards base, glabrous. *Ovules* 4–5. *Style* terete, tapering, bearded on vexillary side; stigma more or less penicillate. *Fruit* a pod, narrowly oblong,

straight, compressed and raised over seeds, 30–44 mm long, 8–9 mm wide, with loose, spongy tissue between seeds, silvery, densely hairy, hairs ascending, silvery; beak in line with upper suture, straight. Seeds 2–4 per pod, 5–7 mm between centres, smooth, whole coloured, brown, oblong, biconvex, 5–5.5 mm long; hilum central; aril absent. Fig. 4 (J–Q).

Other Specimens Examined. NORTHERN TERRITORY: low hills 2 km SE of Fisher Airstrip, 12°34'07"S, 132°39'09"E, 5 Mar. 1991, *K. Brennan* 1106 (DNA); 5.8 km S of Fergusson River, Stuart Highway, 14°08'S, 132°00' E, 14 Dec. 1991, *I.D. Cowie* 2141 (BRI, CANB, DNA, MEL); c. 20 km W of Pine Creek, Jindaree Road, 13°57'S, 131°42'E, 6 Mar. 1985, *C.R. Dunlop* 6769 (DNA, NT); Edith Falls Road, 14°11'08"S, 132°03'14"E, 26 Jan. 1993, *J.L. Egan* 1190 (DNA); Mount Todd Mine site, 14°07'54"S, 132°03'25"E, 17 Mar. 1995, *J.L. Egan* 4447 (DNA); road to Umbrawarra Gorge, 13°55'30"S, 131°45'09"E, 5 Apr. 1995, *J.L. Egan* 4646 (DNA); Umbrawarra Gorge road, 11 km from Stuart Hwy, 13°54'42"S 131°46'09"E, 12 Jan. 1999, *J. Risler* 67 & *R.A. Kerrigan* (DNA); 55 km N of Katherine, old Edith River Falls road, 14°08'S, 132°05'E, 16 Feb. 1987, *S. Tidemann* 47 (DNA); Mt Todd, 14°08'S, 132°03'E, undated, *B. Wilson* 183 (DNA).

Distribution. Endemic to the northern part of the Northern Territory, where it is well known from the Yinberrie Hills north west of Katherine, but also occurring south west of Pine Creek and in the southern part of Kakadu National Pk. Fig. 2B.

Habitat. Grows on ridges in *Eucalyptus* woodland with *Sorghum* understorey, in coarse sandy or gravelly soils frequently of granitic origin.

Flowering and fruiting. Flowers Dec. to Feb.; fruits Mar. to Apr.

Conservation status. No special conservation status is recommended. The plant is common within a relatively restricted range and occurs in the southern part of Kakadu National Pk.

Etymology. Named in honour of the late Caroline (Carrie) Robyn Michell, dear friend and valued colleague to all at DNA, who met a recent untimely death. Her methodical approach, keen eye and hard work greatly increased knowledge of the flora of the Yinberrie Hills and adjacent Nitmiluk (Katherine Gorge) National Pk, near Katherine, NT.

Affinities. The species is similar to *T. andrewii* but has simple or unifoliate leaves with blades 40–70 mm long and 40–76 mm wide (as opposed to 1–5-foliate leaves with leaflets 15–31 mm long and 12–29 mm wide in *T. andrewii*), a shorter calyx (7–9 mm vs 9–11 mm) with largely connate vexillary lobes (divided to the same depth as the lower three in *T. andrewii*), hairs on the outer margin of the keel and on the vexillary side of the terete style and a broader pod (8–9 mm vs 6.5–7 mm). The species also has affinities with *T. uniovulata* and *T. lasiochlaena*, but in these species the vexillary calyx lobes are largely divided to the same depth as the lower three, the vexillary staminal filament is callused near the base, the style is flattened and both have ovaries with 1 (rarely 2) ovules and 1 or 3-foliate leaves. In *T. lasiochlaena*, the crowded upper leaves with flowers in axillary fascicles usually form a leafy, congested false spike.

Tephrosia ephippioides* I.D. Cowie, *sp. nov.

A *T. gyropoda* indumento aureolo brunneo, foliolis angustioribus, tubo staminale ad fenestras piloso et caruncula grandiore, complanata differt.

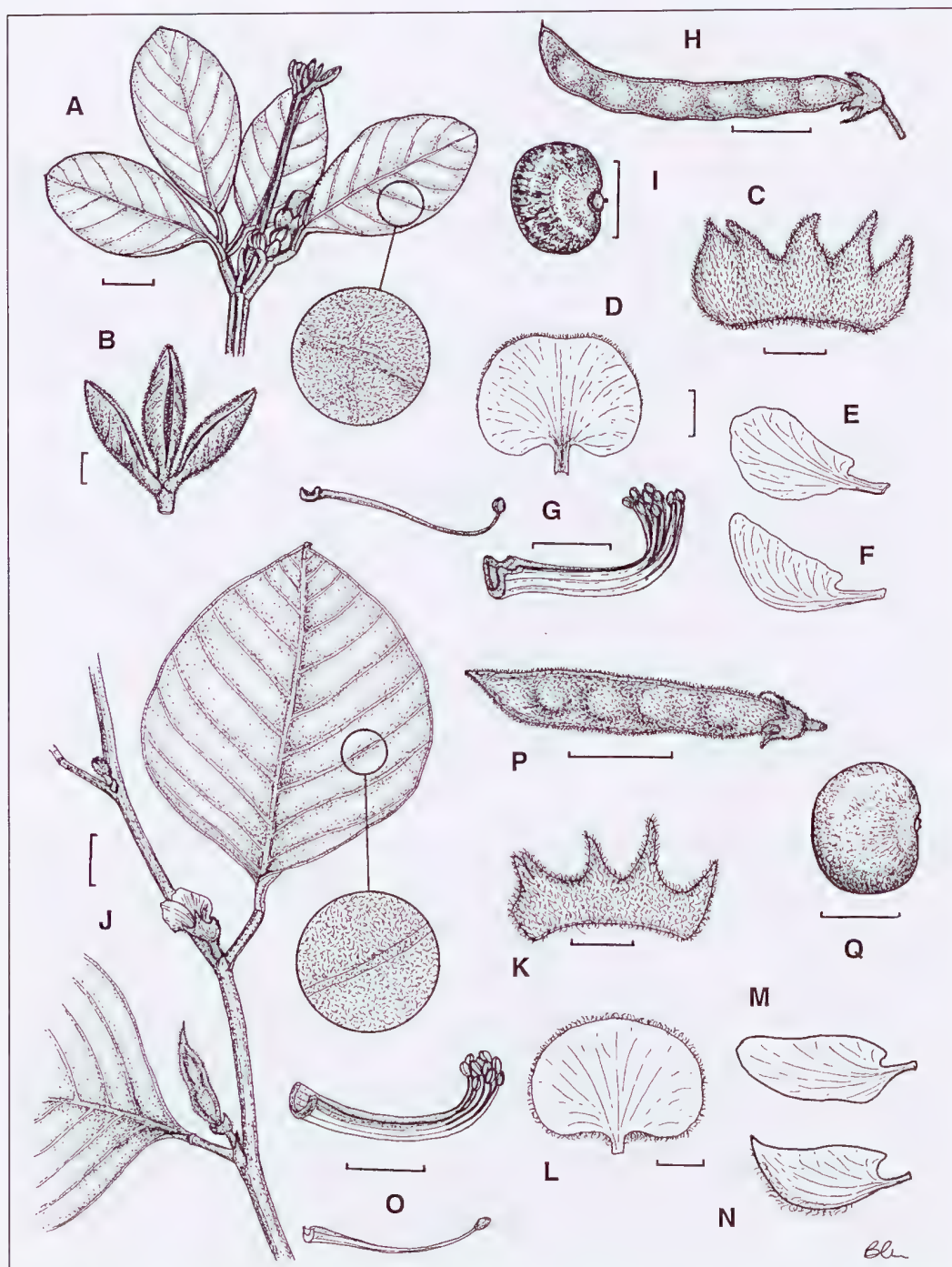


Figure 4. *Tephrosia valleculata*. A – flowering shoot showing venation and indumentum on leaflet undersurface, B – young leaf, C – calyx (abaxial surface, vexillary lobes at LHS), D – standard, E – wing, F – keel, G – stamens, H – pod, I – seed. A – I from G.M. Wightman 7110 (DNA). *Tephrosia carriemichelliae*. J – habit showing venation and indumentum on leaflet undersurface, K – calyx (abaxial surface, vexillary lobes at LHS), L – standard, M – wing, N – keel, O – stamens, P – pod, Q – seed. J – O from I.D. Cowie 1483 & C.R. Dunlop (DNA), P from J. Egan 4447, Q from J. Egan 4646. (A, H, J, P scale bar = 10 mm, others = 3 mm).

Typus: Kakadu National Pk, track to Gubara (Baroalba Spring), NT, 7 Apr. 1994, I.D. Cowie 4845 (*holo*: DNA!; *iso*: BRI!, CANB!, K!, L, MEL!, NSW!, PERTH!).

Shrub, erect, few-stemmed, perennial, to 2 m; rootstock unspecialised. Branchlets, leaf and inflorescence rachis sparsely hairy, hairs short, appressed, yellow brown. *Leaves* imparipinnate; stipules caducous, antrorse, subulate, 2–5 mm long, dark brown; rachis 9–24 mm long to basal leaflets, 9–21 mm between leaflets, 3–15 mm to terminal leaflet, 54–130 mm long overall; stipellae absent; leaflets 11–21, concolorous or slightly discolorous; linear to oblanceolate, flat, (19–)26–46 mm long, 3–9(–19) mm wide, (2.9–)4.7–12 times as long as wide, uniform along rachis or larger towards apex; secondary veins in 7–15 pairs, intersecondary veins reticulate, upper surface glabrous to sparsely hairy, hairs short, appressed or patent, hyaline, lower surface sparsely hairy, hairs short, appressed, hyaline to yellow-brown; base rounded to cuneate, apex acute to obtuse, mucro minute; terminal leaflet 0.7–1.3 times as long as laterals. *Inflorescence* racemose, terminal or axillary, 90–220 mm long, fascicles well spaced, 1–3-flowered. *Bracts* caducous, antrorse, subulate, c. 2 mm long; pedicels 3–8 mm long; bracteoles almost always absent. *Calyx* 3.5–6 mm long, moderately hairy, hairs appressed, yellow-brown; tube 2–2.5 mm long, equal to lateral lobes; lobes attenuate; vexillary lobes united higher than lower three, free for 0.7–1.5 mm; lowest lobe 2–3.5 mm long, distinctly longer than lateral pair. *Corolla* orange, standard 9–12 mm long, claw 2–2.5 mm long, blade depressed ovate, slightly callused at base, apex retuse; wings 9.5–12 mm long, longer than keel, blade obovate; keel 8–9.5 mm long, glabrous. *Staminal tube* hairy near fenestrae, fenestrae callused on margins and at apex; upper filament straight or slightly geniculate in lower half, callused near base, appressed to patent hairy. *Ovules* 7–10. *Style* flattened, uniform, glabrous; stigma penicillate at base. *Fruit* a pod, linear, upcurved near apex, turgid, 38–60 mm long, 3.3–4.2 mm wide, with loose, spongy tissue between seeds, pale brown to yellow-brown, sparsely to moderately hairy, hairs appressed, yellow-brown; beak in line with upper suture, straight. *Seeds* 7–10 per pod, 4–5.5 mm between centres, smooth, mottled, pale and dark brown to black, flattened-ellipsoid to oblong, 2.5–3.6 mm long; hilum subapical; aril flattened, green, asymmetric, 1.1–1.3 mm long. Fig. 5 (J–R).

Other Specimens Examined. NORTHERN TERRITORY: Litchfield National Pk, southern part, 13°31'16"S, 130°50'10"E, 15 Feb. 1996, R. Booth 1455 & I.D. Cowie (DNA); Katherine Gorge, 14°18'S 132°28'E, 16 Jan. 1967, N. Byrnes NB65 (DNA); Katherine Gorge National Pk, 14°18'S 132°28'E, 8 Feb. 1970, N. Byrnes 2049 (DNA); Daly River Rd, E of Reynolds River, 13°31'S, 130°53'E, 11 Apr. 1993, I.D. Cowie 3843 (BRI, CANB, DNA, MEL); Litchfield National Pk, Wangi Falls, 13°09'50"S, 130°41'03"E, 27 Dec. 1993, I.D. Cowie 4541 (CANB, DNA, MEL); top of Jim Jim Falls, 13°17'S, 132°51'E, 30 Jan. 1981, C.R. Dunlop 5671 (BRI, CANB, DNA, NSW, NT), Tolmer Falls, 13°12'S, 130°43'E, 5 Apr. 1991, C.R. Dunlop 8801 & I.D. Cowie (DNA); Edith Falls, 14°11'00"S, 132°11'24"E, 13 Apr. 1995, J.L. Egan 4740 (CANB, DNA); Deaf Adder Gorge, 13°04'S, 132°59'E, 23 Feb. 1977, R.E. Fox 2544 (DNA); Nabarlek, 12°30'S, 133°21'E, 10 Feb. 1989, R. Hinz 411 (DNA); Ngarradj warde djobkeng, Kakadu National Pk, 12°28'S, 132°55'E, 2 Feb. 1984, J. Russell-Smith 1062 (BRI, DNA).

Distribution. This species occurs in the north western part of the Northern Territory extending from Nabarlek in western Arnhem Land (i.e. land belonging to the Arnhem Land Aboriginal Land Trust) south to Nitmiluk (Katherine Gorge) National Pk and west to the Tabletop Range in Litchfield National Pk. Fig. 2B.

Habitat. Grows in *Eucalyptus* savanna or shrubland amongst sandstone outcrops and boulders or on sandsheets associated with sandstone outcrops.

Flowering and fruiting. Flowers Dec. to Feb.; fruits Mar. to Apr.

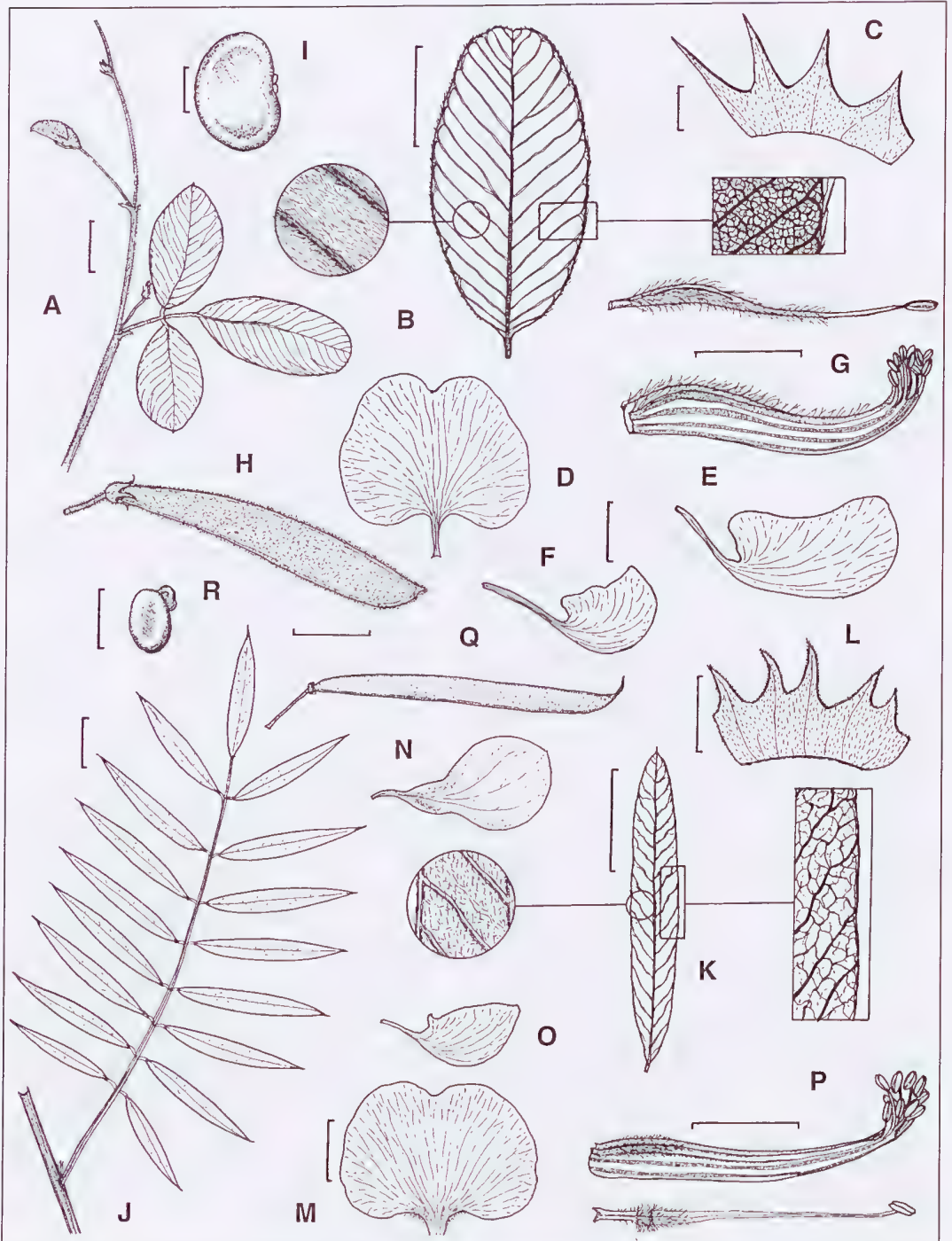


Figure 5. *Tephrosia humifusa*. A – habit, B – leaflet undersurface showing venation and indumentum, C – calyx (abaxial surface, vexillary lobes at RHS, appearing connate), D – standard, E – wing, F – keel, G – stamens, H – pod, I – seed. A – G from *M. Lazarides* 7989 (DNA), H & I from *M. Lazarides* 7765 (DNA). *Tephrosia ephippioides*. J – leaf, K – leaflet undersurface showing venation and indumentum, L – calyx (abaxial surface, vexillary lobes at RHS), M – standard, N – wing, O – keel, P – stamens, Q – pod, R – seed. J, K, Q, R from *I.D. Cowie* 4845 (DNA), L – P from *I.D. Cowie* 8238 (DNA) (A, B, H, J, K, Q scale bar = 10 mm, others = 3 mm).

Conservation status. No special conservation coding is recommended. Most of the known range of the species lies in within Kakadu, Nitmiluk (Katherine Gorge) and Litchfield National Pks. In these areas it is relatively common in suitable habitat and is not considered threatened.

Etymology. The epithet is from the Latin *ephippioideus*, meaning saddle-shaped and refers to the flattened, saddle-like aril present on the seed of this species.

Affinities. This species is most closely related to *T. gyropoda* but differs particularly in the golden brown indumentum, narrower leaflets, staminal tube hairy at the fenestrae and in the larger, flattened aril. It is also related to *T. oblongata*, but has much smaller narrower leaflets, shorter floral bracts (c. 2 mm vs 5–15 mm) and smaller flowers.

Tephrosia gyropoda* I.D. Cowie, *sp. nov.

A T. ephippioides praecipue indumento candido ad hyalino, foliolis latioribus, tubo staminale ad fenestras glabro et caruncula minuta, annulari differt.

Typus: Kakadu National Pk, near East Alligator Ranger Station, 12°25'53"S, 132°57'03"E, 21 Apr 1999, I.D. Cowie 8316 (*holo*: DNA! (2 sheets); *iso*: BRI!, CANB!, K!, L!, MEL!, MO!, NSW!, NY!, PERTH!).

Shrub, erect, multistemmed, perennial, to 3 m; rootstock unspecialised. Branchlets, leaf and inflorescence rachis sparsely hairy, hairs appressed, white to hyaline. **Leaves** imparipinnate; stipules caducous, antrorse, subulate, 3–4.5 mm long, dark brown; rachis 13–42 mm long to basal leaflets, 12–22 mm between leaflets, 6–17 mm to terminal leaflet, (25–)50–125 mm long overall; stipellae absent; leaflets (5–)7–13(–15), almost concolorous, ovate to elliptic (sometimes narrower), flat, 23–53 mm long, 6–23 mm wide, 2.1–3.8 times as long as wide, larger towards base; secondary veins in 12–15 pairs, intersecondary veins reticulate, both surfaces sparsely hairy, hairs short, appressed, white to hyaline; base rounded, apex acute to rounded, mucro minute; terminal leaflet 0.7–1.6 times as long as laterals. **Inflorescence** racemose, sometimes branched, terminal or axillary, to 360 mm long, fascicles well spaced, 1- or 2-flowered. **Bracts** caducous, antrorse, lanceolate, 1–2 mm long; pedicels 2–5 mm long; bracteoles absent. **Calyx** 2–6 mm long, moderately hairy, hairs appressed, white to hyaline; tube 1–2.5 mm long, longer than or sometimes equal to lateral lobes; lobes deltoid to broadly deltoid; vexillary lobes united higher than lower three, free for 0.5–1 mm; lowest lobe 1–4 mm long, equal to or distinctly longer than lateral lobes. **Corolla** orange, standard 7–9.5 mm long, claw c. 2 mm long, blade transversely oblong to transversely reniform, callused at base, apex emarginate; wings 5.5–9 mm long, longer than keel, blade obovate to oblanceolate; keel 5.5–8 mm long, glabrous. **Staminal tube** glabrous near fenestrae, fenestrae slightly callused on margins; upper filament straight in lower half, slightly callused near base, glabrous. **Ovules** 7–9. **Style** flattened, uniform, glabrous; stigma penicillate at base. **Fruit** a pod, linear, upcurved near apex, compressed and raised over seeds, 44–65 mm long, 3.5–5.5 mm wide, with loose, spongy tissue between seeds, pale brown to dark brown, sparsely hairy, hairs short, appressed, hyaline; beak in line with upper suture, straight. **Seeds** 6–8 per pod, 6–7.5 mm between centres, smooth, mottled, pale and dark brown, flattened ellipsoid to oblong, 3.2–4.2 mm long; hilum eccentric to subapical; aril annular, white to greenish, 0.7–1 mm long. Fig. 3 (A–I).

Selected Specimens Examined. NORTHERN TERRITORY: Kakadu National Pk, near top of Moline Rock Hole, 13°34'22"S, 132°15'26"E, 12 May 1997, I.D. Cowie 7546 (BRI, CANB, DNA, K, MEL,

NSW, PERTH); Kakadu National Pk, N side of Mt Brockman, 12°44'S, 132°54'E, 23 Feb. 1973, L.A. Craven 2356 (CANB, DNA); Kakadu National Pk, 6 km ESE of Twin Falls, 13°22'S, 132°48'E, 24 May 1980, L.A. Craven 5835 (CANB, DNA); Kakadu National Pk, c. 18 km SE of Jabiru, 12°48'S, 132°55'E, 30 Mar. 1981, L.A. Craven 6649 (CANB, DNA); Kakadu National Pk, top of Jim Jim Falls, 13°17', 132°51', 29 Jan. 1981, C.R. Dunlop 5655 (BRI, CANB, DNA, MEL, NSW, PERTH); Kakadu National Pk, c. 70 km NE of Pine Creek, 13°33'S, 132°18'E, 5 Mar. 1985 C.R. Dunlop 6765 & G.M. Wightman (BRI, CANB, DNA); Kakadu National Pk, Mt Brockman, 12°47'51"S, 132°54'36"E, 27 Mar. 1995, J.L. Egan 4491 (BRI, DNA, MEL); Red Lilly Lagoon area between Cahills Crossing and Oenpelli, 12°24'S, 133°00'E, 27 May 1973, T.G. Hartley 13726 (CANB, DNA); 44 km SE of Oenpelli, 12°34'S, 133°23'E, 15 June 1978 P.K. Latz 7792 (BRI, CANB, DNA); c. 40 km SSW of Nathan River Homestead, 15°56'S, 135°20'E, 27 Aug. 1985, P.K. Latz 10124 (BRI, DNA); 28 km S of Nathan River Homestead, 15°48'29"S, 135°26'26"E, 16 Sept. 1995, P.K. Latz 14576 (BRI, DNA, NT); Alligator Yard, c. 20 km NW of Bauhinia Downs Station, 16°05'S, 135°22'E, 5 May 1985, G.J. Leach 569 (CANB, DNA, K, MEL, NSW, NT); Kakadu National Pk, headwaters of Twin Falls Creek, 13°26'43"S, 133°51'04"E, 19 Apr. 1995, G.J. Leach 4344 & L. Greschke (BRI, CANB, DNA, NSW); 30 mls [48 km] S of McArthur River Station, 17°6'S, 135°51'E, 24 July 1948, R.A. Perry 1723 (CANB, DNA); Arnhem Land, between East Alligator River and Oenpelli, 12°25'S, 133°00'E, 3 June 1974, R. Pullen 9459 (CANB, DNA); Bulilumbu (Cannon Rock) on Jabiluka outlier, 12°32'S, 132°54'E, 27 Aug. 1980, C.F. Puttock 10246 & J.T. Waterhouse (DNA, UNSW); Three Pools, 14 km S of Cannon Hill, 12°9'S, 132°54'E, 5 Jan. 1984, J. Russell-Smith 914 (BRI, DNA); Ja Ja Massif, 4 km N of Ja Ja camp, 12°31'S, 132°54'E, 3 Feb. 1984, J. Russell-Smith 1053 (BRI, DNA); Edith River Falls, 14°11'S, 132°11'E, 27 Feb. 1965, I.B. Wilson 356 (CANB, DNA).

Distribution. Endemic to the northern NT from western Arnhem Land and Kakadu National Pk south to McArthur River Station near Borroloola. Fig. 2C.

Habitat. Grows in *Eucalyptus* savanna or shrubland, usually among sandstone outcrops or boulders on sand.

Flowering and fruiting. Flowers Jan. to Sept.; fruits Mar. to Sept.

Conservation status. No special conservation coding is recommended. The species is well conserved and no threats are known. It has a fairly wide distribution, with populations occurring in Kakadu National Pk and Nitmiluk (Katherine Gorge) National Pk.

Etymology. The epithet is from the Greek *gyros*, a ring or circle and *podion*, a foot and refers to the annular aril present on the seed of this species.

Affinities. Most closely related to *T. ephippioides*, but differing particularly in the white to hyaline indumentum (rather than golden brown in that species), broader leaflets (lanceolate to elliptic rather than linear to narrowly elliptic in *T. ephippioides*), staminal tube glabrous at the fenestrae (vs hairy in *T. ephippioides*) and aril (minute, annular vs larger and flattened in *T. ephippioides*).

Tephrosia humifusa* I.D. Cowie, *sp. nov.

Affinis *T. bifacialis* a qua pedicellis distincte longioribus, inflorescentia prona, corolla purpurea, semenibus paucioribus, grandioribus et leguminibus latioribus differt.

Typus: Arnhem Land; headwaters of Cadell R., c. 98 km S of Maningrida, NT, 12°56'12"S 134°13'32"E, 22 Mar. 2000, I.D. Cowie 8711 (*holo*: DNA!; *iso*: AD!, BRI!, CANB!, K!, L!, MEL!, MO!, NY!, PER!).

Subshrub, prostrate, multistemmed, perennial with annual aerial parts, taproot uniformly thickened. Branchlets, leaf and inflorescence rachis sparsely hairy, hairs appressed to patent, white to stramineous. *Leaves* pinnately 3-foliolate; stipules persistent, antrorse, attenuate to deltoid, 3–5 mm long, brown; rachis 3–12 mm long to basal leaflets, 2–12 mm to terminal leaflet, 5–23 mm long overall; stipellae absent; *leaflets* usually 3 (rarely 1 or 5); discolorous to strongly discolorous; ovate to oblong-obovate or broadly obovate, flat, 18–40 mm long, 14–29 mm wide, 1.4–2 times as long as wide; secondary veins in 10–15 pairs, intersecondary veins reticulate, upper surface glabrous, lower surface with raised veins, moderately hairy, hairs appressed, white to stramineous; base rounded to broadly cuneate, apex obtuse to emarginate, mucro absent or minute; terminal leaflet 1.2–1.4 times as long as laterals. *Inflorescence* racemose, terminal or leaf opposed, prostrate, to 270 mm long, fascicles well spaced, 2-flowered. *Bracts* persistent, antrorse, attenuate to deltoid, 1.5–3 mm long; pedicels 9–17 mm long; bracteoles absent. *Calyx* 4–6 mm long, sparsely hairy, hairs appressed, white to stramineous; tube 2–3 mm long, shorter than to longer than lateral lobes; lobes attenuate to deltoid; vexillary lobes united higher than lower three, free for c. 1 mm; lowest lobe 2–4 mm long, equal to or sometimes distinctly longer than lateral pair. *Corolla* purple, standard 10–14 mm long, claw 2–3 mm long, blade transversely oblong to transversely reniform, slightly callused at base, apex emarginate to obcordate; wings 10–14 mm long, blade elliptic to obovate, wings longer than keel; keel 8.5–10 mm long, glabrous. *Staminal tube* hairy at fenestrae, fenestrae callused on margins; upper filament straight in lower half, callused near base, patent hairy. *Ovules* 4–7. *Style* flattened, uniform, glabrous; stigma penicillate at base. *Fruit* a pod, narrowly oblanceolate-oblong, straight or slightly curved, compressed and raised over seeds, 35–58 mm long, 7–9 mm wide, tissue usually absent between seeds, pale brown, moderately hairy, hairs patent, white to stramineous; beak eccentric, slightly deflexed. *Seeds* 4–6 per pod, 6–7.5 mm between centres, smooth, whole coloured, olivaceous to brown, ellipsoid to oblong, 5.5–6 mm long; hilum eccentric; aril absent. Fig. 5 (A–I).

Other Specimens Examined. NORTHERN TERRITORY: track from Nabarlek to Tin Camp Creek, 12°21'S, 133°15'E, 18 Feb. 1992, K. Brennan 1845 (DNA); Arnhem Land, c. 53 km SSE of Maningrida, 12°32'47", 134°18'41"E, 11 Apr. 2000, I.D. Cowie 8804 (CANB, DNA, MEL); c. 26 miles E of Mudginberry Homestead, 12°36'S, 133°15'E, 19 Feb. 1973, M. Lazarides 7765 (CANB, DNA); Kakadu National Pk, c. 19 mls [30 km] SE of Mt Basedow, 13°15'S, 132°19'E, 3 Mar. 1973, M. Lazarides 7989 (CANB (2 sheets), DNA); Koolpin Creek area, 13°32'S, 132°35'E, 28 Nov 1978, M.O. Rankin 1627 (DNA).

Distribution. Endemic to northern N.T., in Kakadu National Pk and in Arnhem Land to as far east as near Maningrida. Fig. 2A.

Habitat. In *Eucalyptus* savanna, often on clayey soils derived from dolerite or siltstone.

Flowering and fruiting. Flowers Feb. to Mar.; fruits Feb. to Apr.

Conservation status. Although the species is relatively uncommon, no special conservation coding is recommended as it is well conserved and is under no apparent threat. The entire range of the species lies in Kakadu National Pk or in Arnhem Land.

Etymology. The epithet for this species is from the Latin *humifusus* meaning spread out over the ground or procumbent and refers to the ground-hugging habit of the plant.

Affinities. This species is most closely related to *T. bifacialis* but *T. humifusa* has distinctly longer petioles and pedicels, a prostrate inflorescence, purple corolla, fewer, larger, more widely spaced seeds and broader, narrowly oblanceolate-oblong pods. It is unusual among *Tephrosia* with reticulate intersecondary nerves in having a purple corolla and usually a lack of tissue between seeds, a characters normally found only in those species with type (i) or (ii) venation.

Tephrosia procera* I.D. Cowie, *sp. nov.

A *T. conspicua* W.V. Fitzg. foliolis glabris ad sparsim pilosis, ovatis ad late ellipticis, bracteis floralibus brevioribus, angustioribus, carina secus marginem inferum pilifero, ovulis et seminibus paucioribus separata.

Typus: Little Horse Creek, near Timber Creek, 15°02'S, 130°27'E, 6 Mar. 1989, *G.J. Leach* 2346 & *C.R. Dunlop* (*holo:* DNA! – 2 sheets; *iso:* BRI, CANB, MEL!, K, MO!).

Illustration. *Tephrosia* sp. A (Wheeler, 1992)

Shrub, erect, few-stemmed, perennial, to 5 m, bark corky; rootstock unspecialised. Branchlets, leaf and inflorescence rachis sparsely hairy, hairs appressed, white to slightly yellow-brown. *Leaves* usually digitately 3-foliolate or imparipinnate, rarely 1-foliolate; stipules caducous, antrorse, attenuate, 4–9 mm long, red brown; rachis 6–37 mm long to leaflet or basal leaflets, 26–36 mm between leaflets, 4–30 mm to terminal leaflet, 6–100 mm long overall; stipellae absent; *leaflets* (1–)3–5, coriaceous, slightly discolorous, ovate to broadly elliptic, flat, 31–98 mm long, 14–60 mm wide, 1.6–2.2 times as long as wide, larger towards apex; secondary veins in 12–24 pairs, intersecondary veins reticulate, upper surface with raised veins, glabrous to sparsely hairy, hairs appressed, white, lower surface with raised veins; sparsely hairy, hairs appressed, white to slightly yellow-brown, base rounded or attenuate or broadly cuneate, apex acute to emarginate, mucro minute; terminal leaflet 1–1.4 times as long as laterals. *Inflorescence* racemose, sometimes branched, terminal or axillary, to 400 mm long, fascicles well spaced, 1–3-flowered. *Bracts* caducous, antrorse, attenuate to lanceolate, acuminate, 2–3 mm long; pedicels 5–7 mm long; bracteoles usually absent. *Calyx* 6–9 mm long, moderately hairy, hairs appressed, white to slightly yellow-brown; tube c. 3 mm long, shorter than to longer than lateral lobes; lobes attenuate to narrowly deltoid, vexillary lobes united higher than lower three, free for 1–1.5 mm; lowest lobe 3–6 mm long; distinctly longer than lateral lobes. *Corolla* orange, with a green throat, standard 12–14 mm long, claw 3–4 mm long, blade transversely reniform, callused at base, apex rounded to emarginate; wings 14–15 mm long, longer than keel, blade elliptic; keel 10–11 mm long, hairy along lower margin. *Staminal tube* hairy near fenestrae, fenestrae callused on margins and at apex; upper filament slightly geniculate and callused near base, appressed hairy to densely patent hairy. *Ovules* 7–13. *Style* flattened, uniform, glabrous; stigma penicillate at base. *Fruit* a pod, linear, scarcely upcurved near apex, turgid, 45–90 mm long, c. 4 mm wide, with loose, membranous tissue between seeds, pale to dark brown, moderately hairy, hairs short, appressed and patent, white to stramineous; beak in line with upper suture, straight. *Seeds* 7–12 per pod, 5–6.5 mm between centres, smooth, mottled, pale and dark brown, oblong, slightly flattened, 3.2–4 mm long; hilum central; aril annular, white, c. 0.9 mm long. Fig. 1 (I–P).

Other Specimens Examined. WESTERN AUSTRALIA: Kununurra, near the cotton gin, 15°46'S 128°45'E, 14 Feb. 1977, *A.L. Chapman* 2 (PERTH); Kalumburu Road near Gibb River Crossing, 16°05'48"S 126°30'40"E, 21 May 1993, *I.D. Cowie* 4182 (BRI, CANB, DNA, MEL, NSW, PERTH);

near junction of Mogurnda Creek and Drysdale River, 15°02'S, 126°05'E, 6 Aug. 1975, A.S. George 13462, (PERTH); Kununurra, near the cotton gin, 15°46'S 128°45'E, 10 Jan. 1978, R.J. Petheram s.n. (PERTH).

NORTHERN TERRITORY: Bradshaw Station, Koolendong Valley, 15°16'33"S, 130°02'55"E, 18 Feb. 1999, C.R. Michell 2163, J. Russell-Smith & C. Yates, (DNA, MEL, PERTH); Bradshaw Station, 15°23'47"S, 130°40'33"E, 22 Feb. 1999, C.R. Michell 2285 & C. Yates, (BRI, DNA); Timber Creek area, 15°35'S, 130°23'E, 4 Nov. 1992, G.M. Wightman 5963 (DNA); Bradshaw Station, Barramundi Pump, 15°20'S, 130°07'E, 4 June 1997, G.M. Wightman 6990 (DNA).

Distribution. Endemic to the Kimberley region of W.A. and adjacent parts of the N.T., from near Drysdale River in the west to near Timber Creek in the east. Fig. 2C.

Habitat. Grows in sandy soil, usually amongst sandstone outcrops.

Flowering and fruiting. Flowers Jan. to Mar.; fruits Feb. to May.

Conservation status. No special conservation coding is recommended. The species is distributed across a relatively wide range and is found in Gregory National Pk in the NT. There is no immediate threat to the conservation status of the species as the region is sparsely settled with low intensity cattle grazing the predominant land use. The sandy, infertile and often skeletal soils on which it grows are unattractive for grazing and for development for intensive agriculture.

Etymology. The specific epithet is from the Latin *procera* meaning very tall and refers to the unusual stature of the plant (for a species of *Tephrosia*), which is reported to be up to 5 m in height

Affinities. The species is most closely allied to *T. conspicua* but differs in the glabrous to sparsely hairy leaflets (sericeous, often silvery in *T. conspicua*), shorter, narrower floral bracts (2–3 mm vs 4.5–15 mm long, frequently ovate or broader in *T. conspicua*), keel hairy along the outer margin (glabrous in *T. conspicua*) and the fewer ovules (7–13 vs 14–20 in *T. conspicua*). In the northern and eastern NT, *T. conspicua* also has oblanceolate to obovate leaflets. *Tephrosia procera* is also allied to *T. coriacea*, but differs in the leaves (usually 3 or 5-foliolate as opposed to usually unifoliolate in *T. coriacea*), in the racemose inflorescence (flowers in axillary fascicles in *T. coriacea*), the habit (a tall erect shrub vs a low multistemmed shrub), glabrous fenestrae, 7–13-ovulate ovary (vs 5 or 6-ovulate in *T. coriacea*) and longer pods. An incomplete collection from Sharker Point, near Borrooloola in the NT (P.K. Latz 11133 (DNA)) may also be referable to *T. procera*.

Tephrosia valleculata* I.D. Cowie, *sp. nov.

Tephrosia lasiochlaenae affinis sed ovulis quatuor ad septem; leguminibus leviter curvis, seminibus quatuor ad septem, rostro leguminis recto, in latere vexillari affixo, et fasciculis non nisi axillis supero pauco separata.

Typus: Keep River National Pk, N.T. [precise locality withheld], 21 Apr 1999, G.M. Wightman 7110 (*holo:* DNA!; *iso:* BRI!, MEL!, PERTH!).

Tephrosia flammea Benth. var. *pilosa* C.A. Gardner, *Western Australian Forests Department Bulletin no. 32, Botanical Notes – Kimberley Division of Western Australia* 3: 56 (1923). *Typus*: near Mt Agnes and Moran River, W.A., 26 June 1921, C.A. Gardner 1424 (holo: PERTH!)

Shrub, erect, few-stemmed, perennial, to 2 m; rootstock not seen. Branchlets, leaf and inflorescence rachis densely hairy, hairs ascending to patent, silvery to ferrugineous. *Leaves* unifoliolate to pinnately 3-foliolate, or sometimes imparipinnate; stipules caducous, antrorse, subulate to deltoid, 1–5 mm long, silvery; rachis 2–7(–20) mm long to basal leaflets, 7–14 mm between leaflets, 0–3 mm to terminal leaflet, 2–12(–43) mm long overall; stipellae absent; *leaflets* 1 or 3(–5 in juvenile plants); slightly discolorous; ovate to obovate or oblanceolate, flat, 17–48(–61) mm long, 8–31 mm wide, 1.4–2 times as long as wide, larger towards apex; secondary veins in 4–8 pairs, intersecondary veins reticulate, upper surface with raised veins, densely hairy, hairs appressed to ascending, silvery to ferrugineous, lower surface with raised veins, densely hairy, hairs appressed to ascending, silvery to ferrugineous; base cuneate, apex usually rounded, mucro minute; terminal leaflet 1.1–1.4 times as long as laterals. *Inflorescence* fasciculate, axillary, c. 10 mm long, fascicles often crowded, few and on short lateral shoots, 2–5-flowered. *Bracts* persistent, antrorse, subulate to deltoid, 1–3 mm long; pedicels 3–4 mm long; bracteoles present on pedicels. *Calyx* 5–6 mm long, densely hairy, hairs appressed to patent, silvery to ferrugineous; tube 2–3 mm long, shorter than or equal to lateral lobes; lobes attenuate to deltoid; vexillary lobes divided equally to lower three, free for c. 1.5 mm; lowest lobe 3–3.5 mm long, distinctly longer than lateral lobes. *Corolla* orange, green in centre, standard 7.5–11 mm long, claw 1.5–2 mm long, blade broadly ovate, slightly callused at base, apex emarginate; wings 6.5–10 mm long, longer than keel, blade obovate; keel 7–11 mm long, glabrous. *Staminal tube* glabrous near fenestrae, fenestrae callused on margins; upper filament \pm straight in lower half, callused near base, glabrous. *Ovules* 4–7. *Style* flattened, uniform, glabrous; stigma penicillate at base. *Fruit* a pod, linear to narrowly oblong, slightly upcurved near apex, compressed and raised over seeds, 33–45 mm long, c. 6 mm wide, with loose, membranous tissue between seeds, stramineous, densely hairy, hairs ascending to patent, white to stramineous; beak in line with upper suture, straight. *Seeds* 4–7 per pod, 5.5–6 mm between centres, smooth, mottled, pale and dark brown, oblong to lenticular, flattened, 3–3.5 mm long; hilum central; aril annular, pale, c. 0.4 mm long. Fig. 4 (A–I).

Other Specimens Examined: WESTERN AUSTRALIA: Buccaneer Archipelago [precise locality withheld], 6 Sept. 1988, B.J. Carter 324 (PERTH); Buccaneer Archipelago [precise locality withheld], 1906, W.V. Fitzgerald (PERTH); Buccaneer Archipelago [precise locality withheld], 31 Mar. 1992 A.A. Mitchell 2227 (DNA, PERTH); Buccaneer Archipelago [precise locality withheld], 4 Sept. 1986, M. Smith 86.15 (PERTH).

NORTHERN TERRITORY: Keep River National Pk, [precise locality withheld], 20 May 1997, I.D. Cowie 7596 (DNA); Keep River National Pk, [precise locality withheld], 31 May 1998, I.D. Cowie 7718 (DNA).

Distribution. Occurs sporadically from near Derby, W.A. to Keep River National Pk in the western N.T. Fig. 2C.

Habitat. The species grows in shrubland in sandy, often shallow soil amongst sandstone outcrops.

Flowering and fruiting. Flowers Apr. to Sept.; fruits Mar. to Nov.

Conservation status. Conservation Code for Western Australian Flora: Priority Three. The species is so far known from four widely spaced localities. It is conserved at Keep River National Pk in the NT where there is a population of less than 50 plants, although that Park has not been thoroughly surveyed and further populations may well exist there. The size of other populations is not known. Young plants observed at Keep River National Pk occurred in a relatively fire protected pocket and did not flower until at least their third year. A fire-free interval of more than this period would thus appear necessary for the long term maintenance of populations and fire frequency may act to restrict the abundance of the species.

Etymology. The epithet is from the Latin *valleculatus* meaning furrowed and refers to the distinctly furrowed young branchlets.

Affinities. *Tephrosia valleculata* is closely related to *T. lasiochlaena* (with which it has been confused because of the similar indumentum and leaflets) but *T. valleculata* has a 4–7-ovulate ovary, slightly curved 4–7 seeded pod with straight marginal beak, and axillary fascicles in only the upper few axils. *Tephrosia valleculata* is also closely related to *T. andrewii* but the former has a more erect growth habit, more ferrugineous indumentum, narrower leaflets and pods with a straight marginal beak. Although having some resemblance to *T. carriemichelliae*, *T. valleculata* differs in growth habit, in the more ferrugineous indumentum, in the 1- or 3- (rarely 5) foliolate leaves with narrower leaflets; in the vexillary calyx lobes divided to the same depth as the lower three; in the flattened, uniform, glabrous style with penicillate stigma; in the narrower, slightly curved pods and in the smaller seeds with a pale annular aril.

Collections from juvenile plants at Keep River National Pk, NT had 5-foliate leaves with relatively large leaflets as compared to the more typical 1 or 3-foliate leaves with smaller leaflets found on fertile collections from this and all other populations.

Lectotypifications

Tephrosia flammea F. Muell. ex Benth. *Fl. Austral.* 2: 207 (1864). - *Cracca flammea* (Benth.) Kuntze *Revis. Gen. Pl.* 1: 175 (1891). *Typus*: upper Victoria River, [N.T.], 1855–56, F. Mueller (*lecto* (here chosen): K!; *isolecto*: MEL!).

Bentham cites the specimens “York Sound, A. Cunningham” and “upper Victoria River, F. Mueller”. Also at K is an additional specimen of Mueller’s labelled simply “Victoria River” which was also most likely seen by Bentham. The upper Victoria River specimen is the most complete of the three, is clearly cited and fits the protologue. An R. Brown collection from “Island h” [North Island, N.T.] (dup at BRI) determined as *T. flammea* is not cited by Bentham.

Tephrosia nematophylla F. Muell. *Frag.* 9: 63 (1875). - *Cracca nematophylla* (F. Muell.) Kuntze *Revis. Gen. Pl.* 1: 175 (1891). *Typus*: Port Darwin, F. Schultz 431 (*lecto* (here chosen): MEL!; *isolecto*: K!).

Mueller cites two specimens - Schultz 304 & 431. Of these Schultz 431 is more complete and clearly fits the protologue.

Tephrosia oblongata R. Br. ex Benth. *Fl. Austral.* 2: 205 (1864). - *Cracca oblongata* (Benth.) Kuntze *Revis. Gen. Pl.* 1: 175 (1891). *Typus*: Groote Eylandt, [N.T.], 5–17 Jan. 1803, R. Brown (*lecto* (here chosen): K!, sheet with labels at bottom, one in Brown's writing "*Galega oblongata*, Groote Eylandt" *isolecto*: BRI!, K!, sheet with J.J. Bennett label no. 4129 in top LH corner, E, photo seen, MEL!, 2 sheets).

Bentham cites material as "Islands of the Gulf of Carpentaria, R. Brown" and afterwards adds the comment "A very imperfect specimen of A. Cunningham's from the N coast [Croker Island, NT], may belong to the same species,...". The sheet at K with Brown's hand written label "*Galega oblongata*, Groote Eylandt" is the most complete and clearly fits the protologue. An additional sheet at K with the J.J. Bennett label no. 4129 and sheets at BRI, E and MEL are regarded as part of the same collection.

Tephrosia polyzyga F. Muell. ex Benth. *Fl. Austral.* 2: 206 (1864). - *Cracca polyzyga* (Benth.) Kuntze *Revis. Gen. Pl.* 1: 175 (1891). *Typus*: Arnhem South Bay, point U1 [Mt. Caledon, Caledon Bay, N.T.], 6 Feb. 1803, R. Brown (J.J. Bennett Dist. No. 4127) (*lecto* (here chosen): BM, photo seen; *isolecto*: BRI!, MEL!).

Bentham cites the material "Upper Victoria River, F. Mueller" and "islands of the Gulf of Carpentaria, R. Brown". The Mueller specimen (labeled "Upper Vic R, Jan 1856") appears to consist of just one incomplete specimen with 4 leaves and some buds. As Mueller himself notes on the label "This was the only one found, and this piece was the only branch in flower". Although none of Brown's material was located at K, his collection is more complete, fits and has clearly been used in preparation of the description.

Tephrosia porrecta R. Br. ex Benth. *Fl. Austral.* 2: 206 (1864). - *Cracca porrecta* (R. Br. ex Benth.) Kuntze *Revis. Gen. Pl.* 1: 175 (1891). *Typus*: Islands, North Coast [Morgan Island, N.T.], 20–21 Jan. 1803, R. Brown (*lecto* (here chosen): K!; *isolecto*: BRI!, MEL! 2 sheets).

The material cited by Bentham constitutes collections by R. Brown and J. Armstrong, the latter consisting of a single sheet. The Brown specimen is more complete, fits the description and is chosen as lectotype.

Tephrosia reticulata R. Br. ex Benth. *Fl. Austral.* 2: 205 (1864). - *Cracca reticulata* (Benth.) Kuntze *Revis. Gen. Pl.* 1: 175 (1891). *Typus*: Carpentaria, Point S [Point Blane, N.T.], 28 Jan. 1803, R. Brown (*lecto* (here chosen): K!, sheet with J.J. Bennett label no. 4133 in bottom right hand corner; *isolecto*: BM, photo seen).

Of the syntypes listed by Bentham, Brown's collection from Point Blane best fits the original description, is more complete than the Islands [Morgan Island] collection and best preserves current usage. An additional sheet of the Point Blane collection is located at BM as are two other collections cited by Bentham. Of the latter, the Banks and Solander specimen (2 sheets) from Endeavour River [Qld] represents *T. varians* (F.M. Bailey) C.T. White, while the Cunningham specimen from Simms Island [N.T.] probably represents a third species (perhaps *T. gyropoda* Cowie).

Acknowledgements

I wish to thank Clyde Dunlop for encouraging me to work on *Tephrosia* and for many valuable discussions in the course of the preparation of this paper. Emma Short checked the Latin diagnoses. Two ABLOs (Laurie Jessup and Alex Chapman) obtained photographs of types and literature on my behalf. Beth Chandler prepared the illustrations. Constructive comments on the manuscript from Alex Chapman, Dale Dixon, Clyde Dunlop and an anonymous referee are also appreciated. The assistance of the late Carrie Michell, Andrew A. Mitchell and Glenn Wightman who collected specimens on my behalf is also gratefully acknowledged. The Curators of BRI, CANB, K, NSW, MEL, and PERTH are thanked for providing loans of specimens and/or access to collections at those institutions.

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***Grevillea bipinnatifida* subsp. *pagna* (Proteaceae),
a new subspecies from south-west Western Australia**

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Abstract

Cranfield, R.J. *Grevillea bipinnatifida* subsp. *pagna* (Proteaceae), a new subspecies from south-west Western Australia. *Nuytsia* 15(2): 187–192 (2004). Restricted to the Swan Coastal Plain of Western Australia, *Grevillea bipinnatifida* subsp. *pagna* Cranfield is described. Leaf variation within *Grevillea bipinnatifida* is also illustrated.

Introduction

The new subspecies described here is only known from a small population of plants confined to a wetland habitat north of Waroona, about 112 km south of Perth, Western Australia. Although known for many years this subspecies was not considered taxonomically distinct until the population was surveyed in 1999. McGillivray & Makinson (1993) considered this subspecies as one of the many variations of *Grevillea bipinnatifida*. Olde & Marriott (1995) recognised this subspecies as the ‘prostrate green-leaved form’ within the variable *Grevillea bipinnatifida* R.Br. This subspecies appears to be distinct with leaf lobes much narrower than in the other variant of *Grevillea bipinnatifida* encountered (Figure 1).

Methods

A wide range of fresh and desiccated material was examined in order to determine the critical leaf characters with which to reliably distinguish between the two subspecies. Figure 2 illustrates the leaf blade measurement characters used to differentiate the subspecies of *Grevillea bipinnatifida*.

Taxonomy

***Grevillea bipinnatifida* R.Br.** *Type:* Swan View, Western Australia, December 1926, C.A. Gardner (*neo*: PERTH 01591584). The original type collection (near the Swan River, 1827, C. Fraser) is missing. See McGillivray & Makinson (1993) for discussion and neotypification.

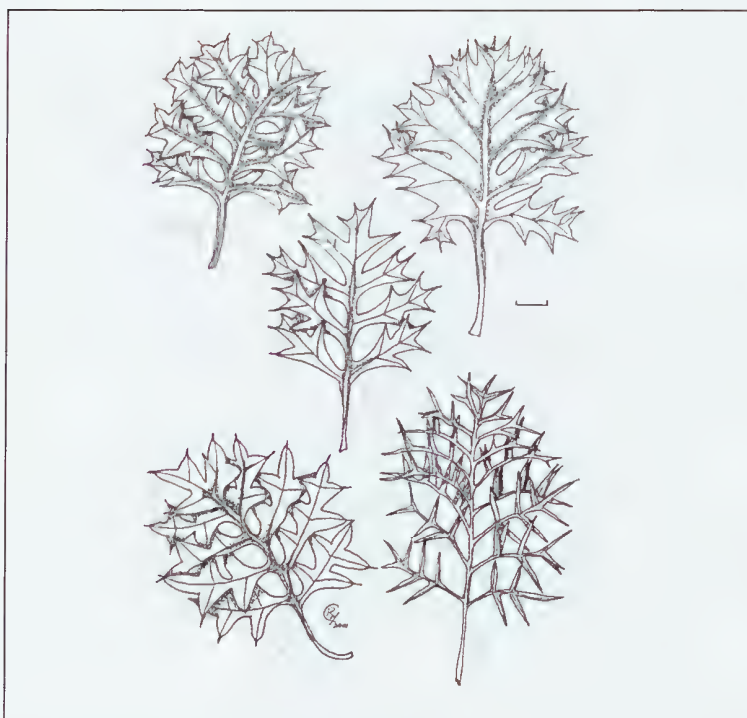


Figure 1. Leaf variations within *Grevillea bipinnatifida*. A - neotype, B-D - variations, E - subsp. *pagna*. Scale = 1 cm.

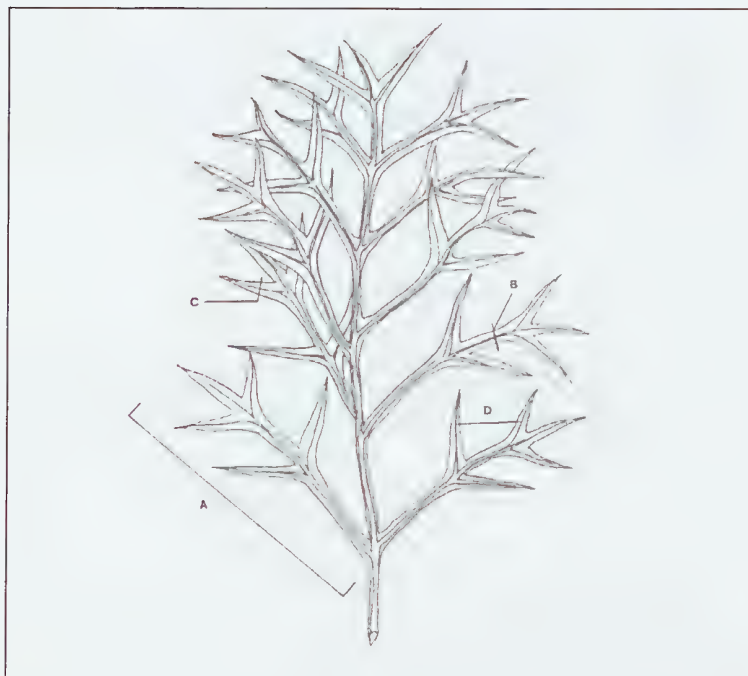


Figure 2. Leaf measurements. A - primary lobe length, B - width of sinus, across both sides of mid rib, C - width of primary lobe, D - width between sinus from mid rib.

Key to the subspecies of *Grevillea bipinnatifida*

1. Primary leaf lobe 5-7 mm wide, opposing sinuses distance of
primary lobes 5-10 mm wide subsp. *bipinnatifida*
1. Primary leaf lobe 1-3 mm wide, opposing sinuses distance of
primary lobes 0.5-2 mm wide subsp. *pagna*

Grevillea bipinnatifida* R.Br. subsp. *bipinnatifida

Shrub 30 cm to 2 m high, lignotuberous. *Leaves* alternate, bipinnate; petiole 29-38 mm long, lamina 80-150 x 60-110 mm, abaxially glabrous-glabrescent, flat to slightly recurved, midrib and veins obvious, lobes triangular, pungent-pointed, margin flat to slightly recurved. Ultimate lateral lobes triangular, 3-20 mm long, primary lobes (A) 3-10 mm long and 5-7 mm wide (C) with a mucro c. 2 mm long, opposing sinus (B), winged 5-10 mm wide, lateral sinus (D) 10-12 mm wide. *Peduncle* 60-65 mm long; inflorescence rachis 80-100 mm long, 10-30 flowered, dull red-pink; rachises with 1 or 2 flowers per node, glabrescent. *Flowers* acroscopic; pedicel 5-17 mm long, tomentose to villous intermixed with glandular hairs, *perianth* 10-12 mm long, striate ribbed, tomentose. *Anthers* c. 0.75 x 0.75 mm. *Style* red to pink with ventral surface flattened, 22-25 mm long, pubescent to glabrescent, *pollen presenter* lateral to oblique, oblong-obovate, convex; margin undulate. *Ovary* sessile, glandular pubescent, c. 1-2 mm long; nectary horizontal, 1-2 mm long. *Fruit* 17-21 x 10 mm tomentose.

Selected specimens examined (all PERTH). WESTERN AUSTRALIA: Maida Vale, 22 Aug. 1961, T.E.H. Aplin 867; 2 km NW of Darlington, 4 Aug. 1979, P. Armstrong 62; Serpentine No. 1 dam, 4 Sept. 1965, A.C. Beauglehole 12426; Red Hill, 30 Aug. 1978, R.J. Cranfield 415; 4 km S of Gillingarra, 17 Sept. 1983, R.J. Cranfield 4097; Statham, 14 Jul. 1923, H.G. Elliott s.n.; 1 mile W of The Lakes, 20 Sept. 1966, R. Filson 8964; Bindoon, 6 Jun. 1960, C.A. Gardner 12434; Godfrey forest block, 1. Oct. 1998, R. Smith RSS602; Lowden Block, 2 Nov. 1998, R. Smith RSS621.

Distribution. Occurring in the Swan Coastal Plain and northern and central parts of the Jarrah Forest IBRA Bioregions (Thackway & Cresswell 1995) of southwest Western Australia.

Habitat. Soils ranging from grey and red brown clays or clay loams to yellow brown sand or clayey sands associated with laterite gravels, granite sheets or outcrops occurring on the western edge and foot slopes of the Darling Scarp. Open forest to open woodland in elevated areas and shrublands fringing wetlands.

Flowering period. June to September.

Conservation status. Not considered to be threatened.

Notes. Within *Grevillea bipinnatifida* subsp. *bipinnatifida* several variations can be observed in leaf divisions, colour and habitat. The extreme narrowness of the leaf lobes of the new subspecies *pagna*, compared to the much broader lobes of the typical form of *Grevillea bipinnatifida* subsp. *bipinnatifida* provides a basis for a separation at the subspecies level.

Grevillea bipinnatifida subsp. *bipinnatifida* and the new subspecies *pagna* appear not to grow in association with each other. *G. bipinnatifida* subsp. *bipinnatifida* occurs over a wide distribution and a wider range of habitats, while the subspecies *pagna* appears to occur in isolated populations with a restricted habitat. Examination of the PERTH Herbarium material showed that within *Grevillea*

bipinnatifida there are narrow leaf variations that appear to be close to the new subsp. *pagna* but can be segregated on habitat. In all instance the precise locations of these narrow leaved forms were vague, occurring within the boundaries of the Perth outer metropolitan area, 90 km north of the known range of the newly defined subsp. *pagna*. These narrow leaved forms occur on the foot slopes of the Darling Scarp associated with wetland areas of heavy clay/loam soil types.

Further studies of *Grevillea bipinnatifida* subsp. *bipinnatifida* are required and may result in the establishment of additional subspecies.

***Grevillea bipinnatifida* subsp. *pagna* Cranfield, subsp. nov.**

A *Grevillea bipinnatifida* subsp. *bipinnatifida* foliorum lobis ultimis lateralibus angustioribus statim dignoscenda.

Typus: 6.5 km NNW of Waroona, Western Australia, 5 October 1999, R.J. Cranfield 14220 (*holo:* PERTH 05344301; *iso:* CANB).

Shrub to 0.70 m high, lignotuberosus. *Leaves* alternate, bipinnate; petiole 20-35 mm long, lamina 35-90 x 40-90 mm, abaxially glabrescent, flat to slightly folded, midrib and veins obvious, lobes with a mucro, margin thickened. Ultimate lateral lobes narrowly triangular, 25-55 mm long, primary lobes 8-11 mm long and 1-3 mm wide with a mucro c. 1 mm long, opposing sinuses, winged 0.5-2 mm wide, lateral sinus 7-15 mm wide. *Peduncle* 30-50 mm long; inflorescence rachis 30-50 mm long, 10-30 flowered, yellow to pale red; rachis with 1 or 2 flowers per node, glabrescent (hirsute in bud). *Flowers* acroscopic; pedicel 6-7 mm long, villous intermixed with glandular hairs, *perianth* 10-11 mm long, striate ribbed, villous. *Anthers* c. 0.75 x 0.75 mm. *Style* red to pink, with the ventral surface flattened, 20-22 mm long, glabrescent, *pollen presenter* oblique, obovate, convex; margin undulate. *Ovary* sessile, pubescent, c. 1-2 mm long; nectary horizontal, 1 mm long. *Fruit* 18-19 x 9-10 mm, glabrescent.

Selected specimens examined (all PERTH). WESTERN AUSTRALIA: N of Waroona, 29 Oct. 1997, R.J. Cranfield 11441; N of Waroona, 19 Jun. 1996, R. Davis 1375; N of Waroona, 20 Oct. 1997, R. Davis 4287; N of Mayfield, 1 Oct. 1998, R. Davis 6598; N of Waroona, 22 Aug. 1993, G.J. Keighery 12970; W of Harvey, 8 Oct. 1979, T.A. Ottway s.n.

Distribution. Known only from the type location.

Habitat. Seasonally wet shrubland (*Xanthorrhoea preissii*) over low sedges (*Mesomelaena stygia*) fringed by open Marri woodland, occurring on grey to black sandy clay.

Flowering time. August to October.

Conservation Status. CALM Conservation Codes for Western Australian Flora: Priority One. This species is known only from one or a few populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verge.

Etymology. From the Nyoongar language of the traditional inhabitants of the area *pagna* - forest bush (Bindon & Chadwick, 1992), reflecting the preference of this subspecies to grow as an understorey woodland plant.

Notes. *Grevillea bipinnatifida* subsp. *pagna* has a shorter rachis and leaf characters that tend to be smaller and narrower than those of subsp. *bipinnatifida*. The overall width of the lamina appears to be greater in subspecies *pagna* but this was not conclusive in the material examined. The much narrower primary lobes are considered to be the main distinguishing feature for subspecies *pagna*. Flowering time differences between the two subspecies indicates that subspecies *pagna* flowers much later.

The habitat differences between the two taxa appear to be significant. Subspecies *pagna* is confined to a specific wetland type. Although other possible locations of the habitat exist in the area, distinct differences can be observed in the soil types and the associated vegetation present. Habitat records, although limited, indicate that the occurrence of this subspecies on the western boundary of the Darling Range is restricted. Habitats that support the typical subspecies of *Grevillea bipinnatifida* are far more varied and widespread.

Acknowledgments

The Latin description was kindly prepared by Paul Wilson. I also wish to thank Barbara Rye and Terry Macfarlane for their comments and advice.

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Lichen Census of Western Australia

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Abstract

Cranfield, R.J. Lichen Census of Western Australia, *Nuytsia* 15(2): 193–220 (2004). A list of known lichen taxa for Western Australia is presented; family, genus, species and infra species are listed with authors and reference to original publication. Biogeographic regions are indicated for each species based on the collections of the Western Australian Herbarium. A table giving statistical data for families and genera is included.

Introduction

Lichens have hitherto been poorly known and under-collected in Western Australia. With a growing need to conserve the biota, it is essential to have a census of known taxa occurring within the State. A census provides a baseline from which to assess conservation status of species, develop identification keys, and manage associated information and specimen collections.

The size of the described lichen flora for Western Australia is now considered to exceed 580 species, compared with 192 cited by Sammy (1985), 194 species were earlier recognised by Richardson and Richardson (1982) and subsequently 465 species by Sammy (1995). This increase reflects an upsurge in interest in lichens in Western Australia in recent years, including my own studies of lichens of the southern forests. There has been a considerable increase recently in the size of the collection at PERTH. Even so, not all taxa in the census are present in the PERTH collection because earlier collectors did not always lodge duplicates, as now required. A table is provided which shows statistics of family, genus and species numbers known from Western Australia (Table 1), presented in a style compatible with Green (1985).

Methods

This census lists the names of all currently recognised species of lichens for Western Australia, including non-lichenised species of lichen-dominated genera. Included in the listing are the authors and reference to original publication of each name. Selected synonyms are included to provide cross-references for recent name changes. This census is maintained in an electronic form allowing for updating records to maintain currency of data. The published *Checklist of Australian Lichens and Allied Fungi* (Filson, R. 1996) and the electronic *Checklist of Australian Lichens* (McCarthy, P. 1999) including updates to December 2001, the published hardcopy book version (McCarthy 2003) formed

the basis of this census along with literature records and Western Australian Herbarium (PERTH) collections, many of the latter annotated by specialists. The checklist contains updates to the end of 2003.

Table 1. WA Lichen Family and Genera Statistics. Families followed by number of genera and species – genera with number of species. Family names are preceded by PERTH's family number, used for curatorial purposes only.

Perth Family No.	Family Name	Genera	Species	Perth Family No.	Family Name	Genera	Species
797	Acarosporaceae	3	11	721	Coniocybaceae	1	4
	<i>Acarospora</i>		7		<i>Chaenotheca</i>		4
	<i>Polysporina</i>		1	805	Deuteromycotina	3	5
	<i>Sarcogyne</i>		3		<i>Lepraria</i>		3
808	Agyriaceae	3	5		<i>Leprocaulon</i>		1
	<i>Placopsis</i>		1		<i>Normandina</i>		1
	<i>Trapelia</i>		2	727	Graphidaceae	3	5
	<i>Trapeliopsis</i>		2		<i>Dyplotobia</i>		1
802	Arthoniaceae	2	2		<i>Graphis</i>		3
	<i>Arthonia</i>		1		<i>Phaeographis</i>		1
	<i>Arthothelium</i>		1	728	Gyalectaceae	1	1
700	Arthopyreniaceae	1	1		<i>Coenogium</i>		1
	<i>Arthopyrenia</i>		1	730	Heppiaceae	2	3
705	Bacidiaceae	3	5		<i>Gloeheppia</i>		1
	<i>Bacidia</i>		2		<i>Heppia</i>		2
	<i>Catinaria</i>		1	732	Hymeneliaceae	1	2
	<i>Lecania</i>		2		<i>Aspicilia</i>		2
709	Caliciaceae	2	10	735	Lecanoraceae	8	39
	<i>Calicium</i>		9		<i>Clauzadeana</i>		1
	<i>Cyphelium</i>		1		<i>Haematomma</i>		3
710	Candelariaceae	2	5		<i>Lecanora</i>		23
	<i>Candelaria</i>		1		<i>Lecidella</i>		2
	<i>Candelariella</i>		4		<i>Phacopsis</i>		1
711	Catillariaceae	2	4		<i>Pyrrospora</i>		2
	<i>Catillaria</i>		3		<i>Ramboldia</i>		4
	<i>Solenopsora</i>		1		<i>Tephromela</i>		3
714	Chrysorhricaceae	1	1	736	Lecideaceae	2	14
	<i>Chrysothrix</i>		1		<i>Lecidea</i>		11
716	Cladoniaceae	5	42		<i>Toninia</i>		3
	<i>Cladia</i>		7	738	Letrouitaceae	1	1
	<i>Cladonia</i>		30		<i>Letrouitia</i>		1
	<i>Heterodea</i>		2	739	Lichenotheliaceae	1	2
	<i>Ramalea</i>		1		<i>Lichenothelia</i>		2
	<i>Thysanothecium</i>		2	740	Lichinaceae	5	7
718	Coccocarpiaceae	2	4		<i>Ephebe</i>		1
	<i>Coccocarpia</i>		3		<i>Lichina</i>		1
	<i>Spilonema</i>		1		<i>Phloeopeccania</i>		1
720	Collemataceae	2	9		<i>Poroscyphus</i>		2
	<i>Collema</i>		5		<i>Pterygiopsis</i>		2
	<i>Leptogium</i>		4				

Table 1 (continued).

Perth No.	Family Name	Genera	Species	Perth No.	Family Name	Genera	Species
742	Lobariaceae	1	4	760	Pertusariaceae	2	19
	<i>Pseudocyphellaria</i>		4		<i>Ochrolechia</i>		5
744	Megalariaceae	1	1		<i>Pertusaria</i>		14
	<i>Megalaria</i>		1	763	Phyllopsoraceae	1	3
745	Megalosporaceae	1	1		<i>Hypocenomyce</i>		3
	<i>Megalospora</i>		1	764	Physciaceae	16	81
748	Microcaliciaceae	1	1		<i>Amandinea</i>		1
	<i>Microcalicium</i>		1		<i>Australiaena</i>		1
749	Monobastiaceae	1	1		<i>Buellia</i>		20
	<i>Anisomeridium</i>		1		<i>Dimelaena</i>		3
751	Mycocaliciaceae	2	5		<i>Diploicia</i>		1
	<i>Chaenothecopsis</i>		2		<i>Diplotomma</i>		1
	<i>Mycocalicium</i>		3		<i>Dirinaria</i>		5
752	Mycoporaceae	1	1		<i>Hafellia</i>		4
	<i>Mycoporum</i>		1		<i>Heterodermia</i>		5
756	Pannariaceae	5	11		<i>Hyperphyscia</i>		1
	<i>Degelia</i>		2		<i>Phaeophyscia</i>		2
	<i>Leproloma</i>		1		<i>Physcia</i>		17
	<i>Pannaria</i>		4		<i>Physconia</i>		2
	<i>Parmeliella</i>		3		<i>Pyxine</i>		10
	<i>Psoroma</i>		1		<i>Rinodina</i>		7
757	Parmeliaceae	20	185		<i>Rinodinella</i>		1
	<i>Canomaculina</i>		2	766	Placynthiaceae	1	1
	<i>Canoparmelia</i>		4		<i>Placynthium</i>		1
	<i>Chondropsis</i>		1	1143B	Platyglloeaceae	1	1
	<i>Flavoparmelia</i>		9		<i>Biatoropsis</i>		1
	<i>Hypogymnia</i>		4	809	Porinaceae	1	2
	<i>Hypotrachyna</i>		1		<i>Porina</i>		2
	<i>Imshaugia</i>		1	767	Porpidiaceae	2	3
	<i>Melanelia</i>		1		<i>Paraporpidia</i>		2
	<i>Menegazzia</i>		4		<i>Porpidia</i>		1
	<i>Noefuscelia</i>		21	768	Psoraceae	1	3
	<i>Pannoparmelia</i>		1		<i>Psora</i>		3
	<i>Paraparmelia</i>		14	769	Pyrenulaceae	2	3
	<i>Parmelia</i>		2		<i>Parmentaria</i>		1
	<i>Parmelina</i>		5		<i>Pyrenula</i>		2
	<i>Parmelinopsis</i>		1	771	Ramalinaceae	1	11
	<i>Parmotrema</i>		5		<i>Ramalina</i>		11
	<i>Punctelia</i>		4	772	Rhizocarpaceae	1	4
	<i>Relicinopsis</i>		1		<i>Rhizocarpon</i>		4
	<i>Rimelia</i>		3	774	Roccellaceae	1	1
	<i>Xanthoparmelia</i>		100		<i>Roccella</i>		1
758	Peltigeraceae	1	3	777	Schaereriaceae	1	1
	<i>Peltigera</i>		3		<i>Schaereria</i>		1
759	Peltulaceae	1	14	806	Siphulaceae	1	1
	<i>Peltula</i>		14		<i>Siphula</i>		1

Table 1 (continued).

Perth Family Name No.	Genera	Species	Perth Family Name No.	Genera	Species
781 Sphinctrinaceae <i>Sphinctrina</i>	1	1 1	1065 Tricholomataceae <i>Omphalina</i>	1	2 2
783 Stereocaulaceae <i>Stereocaulon</i>	1	1 1	792 Trypetheliaceae <i>Trypethelium</i>	1	1 1
786 Teloschistaceae <i>Caloplaca</i> <i>Fulgensia</i> <i>Teloschistes</i> <i>Xanthoria</i>	4	25 19 2 2 2	810 Umbilicariaceae <i>Umbilicaria</i>	1	1 1
803 Thelotremataceae <i>Diploschistes</i> <i>Thelotrema</i>	2	12 11 1	795 Verrucariaceae <i>Endocarpon</i> <i>Lauderlindsaya</i> <i>Placidium</i> <i>Verrucaria</i>	4	18 9 1 2 6
810 Tremolechiaceae <i>Tremolechia</i>	1	1 1			

In the census table (Appendix 1), taxa are arranged alphabetically by genus and then species. Families have been assigned numbers to accord with the methods used at PERTH for other plant groups. Each taxon has the family number listed against it. This feature is to enable this census to be incorporated in FloraBase (<http://florabase.calm.wa.gov.au/>), the Western Australian Herbarium's electronic flora information system. Distribution data for Western Australia is presented using bioregions proposed by the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway and Cresswell 1995).

A key to author abbreviations is also provided (Appendix 2).

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Appendix 1. Lichen Census of Western Australia. Note that 'specimen' included in the Authority field denotes a herbarium determination as the only authority for the name.

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
797	Acarosporaceae	<i>Acarospora</i>	<i>corvina</i>			A. Massal.	Ric. Auton. Lich. Crost. 28 (1852)	unknown
797	Acarosporaceae	<i>Acarospora</i>	<i>clitina</i>			(Taylor) Zahlbr. ex Rech.	Denkschr. Kaiserl. Akad. Wiss. Wien. Math.-Naturwiss. Kl. 88: 28 (1911)	Coo, Mur, Gsd, Pil, Aw, Gs, Jf, Ck
797	Acarosporaceae	<i>Acarospora</i>	<i>Negligens</i>			H. Magn.	Bih. Kongl. Svenska Vetensk-Akad. Handl. 7: 58 (1929)	unknown
797	Acarosporaceae	<i>Acarospora</i>	<i>nodulosa</i>			(Dufour) Hue	Nouv. Arch. Mus. Hist. Nat., sér. 5, 1: 160 (1909)	Mur, Coo, Gs
797	Acarosporaceae	<i>Acarospora</i>	<i>nodulosa</i>	<i>var. reagens</i>	<i>Acarospora reagens</i>	(Zahlbr.) Clauzade & Cl. Roux	Bull. Soc. Bot. Centre-Quest. N.s. 15:129 (1984)	Mur, Coo
797	Acarosporaceae	<i>Acarospora</i>	<i>novae-hollandiae</i>			H. Magn.	Bih. Kongl. Svenska Vetensk. Akad. Handl. 7: 69 (1929)	Mur
797	Acarosporaceae	<i>Acarospora</i>	<i>reagens</i>			Zahlbr.	Bih. Kongl. Svenska Vetensk. Akad. Handl. 13: 162 (1902)	Mur, Coo
797	Acarosporaceae	<i>Acarospora</i>	<i>sinopica</i>			(Wahlenb.) Körb.	Körb., <i>Parerga Lichenol.</i> : 57 (1852)	Gsd, Mur,
797	Acarosporaceae	<i>Acarospora</i>	<i>smaragdula</i>			(Wahlenb.) A. Massal	Ric. Auton. Lich. Crost.: 29 (1852)	Mur
764	Physciaceae	<i>Amandinea</i>	<i>punctata</i>		<i>Buellia punctata</i>	(Hoffm.) Coppins & Scheid.	Lichenologist 25: 343 (1993)	unknown
749	Monoblastiaceae	<i>Anisomeridium</i>	<i>americanum</i>		<i>Pleurotrema pyrenuloides</i>	(A. Massal.) R.C. Harris	More Florida Lich.: 144 (1955)	Nk
802	Arthoniaceae	<i>Arthonia</i>	<i>ilicina</i>			Taylor	Fl. Hibern. 2: 105 (1836)	War
700	Arthopyreniaceae	<i>Arthopyrenia</i>	<i>analepta</i>			(Ach.) A. Massal	Ric. Auton. Lich. Crost. : 165 (1852)	DI
802	Arthoniaceae	<i>Arthothellum</i>	<i>interiens</i>			(Nyl.) Zahlbr.	Cat. Lich. Univ. 2: 127 (1924)	War
732	Hymeneliaceae	<i>Aspicilia</i>	<i>calcareo</i>		<i>Lecanora calcarea</i>	(L.) Mudd.	Man. Brit. Lich.: 161 (1861)	Mur, Coo, Esp
732	Hymeneliaceae	<i>Aspicilia</i>	<i>calcareo</i>	<i>var. caesiocalba</i>		(le Prev.) Hazsl.	Magyar Birodalom Zuzmó-Florája: 129 (1884)	unknown
764	Physciaceae	<i>Australoena</i>	<i>streimannii</i>			Mazzer, H. Mayrhofer & Elix	Lichenologist 29: 36 (1997)	DI, Ck
705	Bacidaceae	<i>Bacidia</i>	<i>microphyllina</i>			(Tuck.) Riddle	Mycologia 15: 80 (1923)	Nk
705	Bacidaceae	<i>Bacidia</i>	<i>millegiana</i>			(Taylor) Zahlbr. in H. Wawra & E. Beck	Itin. Princ. S. Coburgi 2: 152 (1888)	Jf, War
736	Lecideaceae	<i>Blatora</i>	<i>sorediosa</i>		<i>see Lecanora austrosorediosa</i>	Rambold	Biblioth. Lichenol. 34: 75 (1989)	unknown
1143	Platygoaceae	<i>Blatoropsis</i>	<i>usneanum</i>			Räsänen	Ann. Bot. Soc. Zool.-Bot. Fenn. "Vanamo" 5(9): 8 (1934)	unknown
764	Physciaceae	<i>Buellia</i>	<i>cretacea</i>			Müll. Arg.	Flora 72: 512 (1889)	unknown
764	Physciaceae	<i>Buellia</i>	<i>desertorum</i>			Müll. Arg.	Hedwigia 31: 197 (1892)	unknown
764	Physciaceae	<i>Buellia</i>	<i>dijlana</i>			Trinkaus, in Trinkaus <i>et al.</i>	Lichenologist 33: 52 (2001)	
764	Physciaceae	<i>Buellia</i>	<i>discoloris</i>		<i>see Hafellia discoloris</i>	(Fr.) Mudd.	Man. Brit. Lich.: 216 (1861)	Mal, Nk, Sw
764	Physciaceae	<i>Buellia</i>	<i>dissa</i>		<i>see Hafellia dissa</i>	(Surt.) Zahlbr.	Cat. Lich. Univ. 7: 357 (1931)	unknown
764	Physciaceae	<i>Buellia</i>	<i>epigaea</i>			(Hoffm.) Tuck.	Gen. Lich.: 185 (1872)	Sw

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
764	Physciaceae	<i>Buellia</i>	<i>erubescens</i>			Arnold	Verh. K.K. Zool.-Bot. Ges. Wien 25: 493 (1875)	unknown
764	Physciaceae	<i>Buellia</i>	<i>farinulenta</i>			Müll. Arg.	Bull. Herb. Boissier 1: 50 (1893)	unknown
764	Physciaceae	<i>Buellia</i>	<i>georgei</i>			Trinkaus, H. Maryrhofer & Elix	Lichenologist 33: 55 (2001)	
764	Physciaceae	<i>Buellia</i>	<i>glomerulans</i>			(Müll. Arg.) Zahlbr.	Cat. Lich. Univ. 7: 464 (1931)	unknown
764	Physciaceae	<i>Buellia</i>	<i>intuscescens</i>			Müll. Arg.	Hedwigia 31: 197 (1892)	unknown
764	Physciaceae	<i>Buellia</i>	<i>lobata</i>			Trinkaus & Elix in Trinkaus et al.	Lichenologist 33: 58 (2001)	
764	Physciaceae	<i>Buellia</i>	<i>marginulata</i>			(Müll. Arg.) Zahlbr.	Cat. Lich. Univ. 7: 464 (1931)	unknown
764	Physciaceae	<i>Buellia</i>	<i>pruinosa</i>		<i>Buellia subalbula</i>	Müll. Arg.	Bull. Herb. Boissier 1: 51 (1893)	
764	Physciaceae	<i>Buellia</i>	<i>punctata</i>	var. <i>aequala</i>		Zahlbr.	Cat. Lich. Univ. 7: 400 (1931)	Swa, Esp, Mal
764	Physciaceae	<i>Buellia</i>	<i>retrovertens</i>			Tuck.	Syn. N. Amer. Lich. 2: 89 (1888)	unknown
764	Physciaceae	<i>Buellia</i>	<i>spuria</i>			(Schaer.) Anzi	Cat. Lich. Sondr.: 87 (1860)	unknown
764	Physciaceae	<i>Buellia</i>	<i>stellulata</i>			(Taylor) Mudd.	Man. Brit. Lich.: 216 (1861)	Esp, Jf, War
764	Physciaceae	<i>Buellia</i>	<i>signata</i>			Tuck.	Syn. N. Amer. Lich. 2: 90 (1888)	
764	Physciaceae	<i>Buellia</i>	<i>subalbula</i>		see <i>Buellia pruinosa</i>	(Nyl.) Müll. Arg.	Rev. Mycol. (Toulouse) 2: 79 (1880)	Swa, Co, Mur
764	Physciaceae	<i>Buellia</i>	<i>subcoronata</i>			(Müll. Arg.) Malm.	Ark. Bot. 21A: 23 (1927)	unknown
764	Physciaceae	<i>Buellia</i>	<i>subdisciformis</i>	var. <i>subdisciformis</i>		(Leight.) Vain.	Étud. Class. Lich. Brésil 1: 167 (1890)	War
764	Physciaceae	<i>Buellia</i>	<i>albatra</i>		see <i>Diploloma albatrum</i>			
709	Caliciaceae	<i>Calicium</i>	<i>abietinum</i>			Pers.	Tent. Disp. Meth. Fung.: 59 (1797)	unknown
709	Caliciaceae	<i>Calicium</i>	<i>chlorosporum</i>			F. Wilson, in Bailey	Bot. Bull. Dept. Agric., Queensland 7: 29 (1891)	
709	Caliciaceae	<i>Calicium</i>	<i>glaucescens</i>			Ach.	Methodus: 97 (1803)	Jf
709	Caliciaceae	<i>Calicium</i>	<i>robustum</i>			Nyl.	Ann. Sci. Nat. Bot., sér. 4, 15: 39 (1861)	unknown
709	Caliciaceae	<i>Calicium</i>	<i>salicinum</i>			Pers.	Ann. Bot. (Usteri) 7: 20 (1794)	unknown
709	Caliciaceae	<i>Calicium</i>	<i>subquercinum</i>			Asch.	J. Jap. Bot. 8: 2 (1932)	unknown
709	Caliciaceae	<i>Calicium</i>	<i>tricolor</i>			F. Wilson	Victorian Naturalist 6: 64 (1889)	unknown
709	Caliciaceae	<i>Calicium</i>	<i>victorianum</i>	var. <i>desidiosum</i>		Tibell	Symb. Bot. Upsal. 27: 64 (1987)	unknown
709	Caliciaceae	<i>Calicium</i>	<i>victorianum</i>	var. <i>victorianum</i>		(F. Wilson) Tibell	Symb. Bot. Upsal. 27(1): 59 (1987)	unknown
786	Teloschiaceae	<i>Caloplaca</i>	<i>cerina</i>			(Ehrh.) Th. Fr.	Lich. Arct.: 118 (1860)	unknown
786	Teloschiaceae	<i>Caloplaca</i>	<i>cinnabarina</i>			(Ach.) Zahlbr. in A. Engler & K. Prantl	Nat. Pflanzenfam. 1: 1: 228 (1907)	DI, Nk, Aw
786	Teloschiaceae	<i>Caloplaca</i>	<i>clirina</i>			(Hoffm.) Th. Fr.	Nova Acta Regiae Soc. Sci. Upsal., sér. 3: 3: 218 (1889)	Mur, Swa, Mal, Aw
786	Teloschiaceae	<i>Caloplaca</i>	<i>cupulifera</i>			(Van.) Zahlbr.	Cat. Lich. Univ. 7: 226 (1931)	Nk
786	Teloschiaceae	<i>Caloplaca</i>	<i>erythrosticta</i>			(Taylor) Zahlbr.	Cat. Lich. Univ. 7: 116 (1930)	
786	Teloschiaceae	<i>Caloplaca</i>	<i>ferruginea</i>			(Huds.) Th. Fr.	Nova Acta Regiae Soc. Sci. Upsal., sér. 3: 3: 223 (1861)	Mur, Mal, Aw

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
786	Teloschistaceae	Caloplaca	<i>flavobuscens</i>			(Huds.) J.R. Laundon	Lichenologist 8: 147 (1976)	Jf, Swa, War, Mal
786	Teloschistaceae	Caloplaca	<i>granularis</i>			(Müll. Arg.) Zahlbr.	Cat. Lich. Univ. 7: 141 (1930)	unknown
786	Teloschistaceae	Caloplaca	<i>holocarpa</i>			(Hoffm.) A.E. Wade	Lichenologist 3: 11 (1965)	Gs
786	Teloschistaceae	Caloplaca	<i>irrubescens</i>			(Nyl.) Zahlbr.	Verh. K.K. Zool.-Bot. Ges. Wien 48: 365 (1898)	unknown
786	Teloschistaceae	Caloplaca	<i>lactea</i>			(A. Massal.) Zahlbr.	Oesterr. Bot. Z. 51: 347 (1901)	Gs, Nk
786	Teloschistaceae	Caloplaca	<i>lateritia</i>			(Taylor) Zahlbr.	Cat. Lich. Univ. 7: 154 (1930)	unknown
786	Teloschistaceae	Caloplaca	<i>leptozonia</i>			(Nyl.) Zahlbr.	Cat. Lich. Univ. 7: 154 (1931)	Nk, Dl
786	Teloschistaceae	Caloplaca	<i>luteoalba</i>			(Turner) Th Fr.	Nova Acta Regiae Soc. Sci. Upsal. sér. 3: 3: 220 (1861)	unknown
789	Teloschistaceae	Caloplaca	<i>marina</i>			(Wedd.) Zahlbr. in G.E. Du Riez	Melh. Grund. Mod. Pflanzensoziol.: 170 (1921)	War, Esp
786	Teloschistaceae	Caloplaca	<i>murorum</i>	var. <i>areolata</i>		(Müll. Arg.) Zahlbr.	Cat. Lich. Univ. 7: 192 (1983)	
789	Teloschistaceae	Caloplaca	<i>murorum</i>	var. <i>miniata</i>		(Hoffm.) Th. Fr.	Lichenogr. Scand. 1: 170 (1871)	unknown
789	Teloschistaceae	Caloplaca	<i>murorum</i>	var. <i>obliterata</i>		(Pers.) Jatta	Syll. Lich. Ital.: 238 (1900)	unknown
789	Teloschistaceae	Caloplaca	<i>saxicola</i>			(Hoffm.) Nordin	Caloplaca, sect. Gasparinia i Nordeuropa: 87 (1972)	unknown
710	Candelariaceae	Candelaria	<i>concolor</i>			(Dicks.) B. Stein in F.J. Cohn	Krypt.-Fl. Schlesien 2(2): 84 (1879)	unknown
710	Candelariaceae	Candelariella	<i>artenaria</i>			Räsänen	Annales Soc. Ci. Argent. 78: 137 (1939)	Aw
710	Candelariaceae	Candelariella	<i>virellina</i>			(Hoffm.) Müll. Arg.	Bull. Herb. Boissier 2, append. 1: 47 (1894)	Aw, Esp, War
710	Candelariaceae	Candelariella	<i>xanthostigma</i>			(Ach.) Lettau	Hedwigia 52: 196 (1912)	Gs, Mur, Nk
710	Candelariaceae	Candelariella	<i>xanthostigmoides</i>			(Müll. Arg.) R.W. Rogers	Muelleria 5: 32 (1928)	Aw
757	Parmeliaceae	Canomaculina	<i>subcaperata</i>		<i>Rimeliella subcaperata</i>	(Kremp.) Elix	Mycotaxon 65: 477 (1997)	unknown
757	Parmeliaceae	Canomaculina	<i>subsumpta</i>		<i>Rimeliella subsumpta</i>	(Nyl.) Elix	Mycotaxon 65: 477 (1997)	unknown
757	Parmeliaceae	Canoparmelia	<i>macrospora</i>			Elix & J. Johnst.	Mycotaxon 31: 491 (1988)	unknown
757	Parmeliaceae	Canoparmelia	<i>owariensis</i>			(Asahina) Elix	Mycotaxon 47: 127 (1993)	Nk
757	Parmeliaceae	Canoparmelia	<i>pruinata</i>			(Müll. Arg.) Elix & J. Johnst.	Brunonia 9: 158 (1986)	Aw, Jf, War, Gs
757	Parmeliaceae	Canoparmelia	<i>subarida</i>			Elix	Mycotaxon 47: 103 (1993)	Esp
711	Catillariaceae	Catillaria	<i>chalybeia</i>			(Borrer) A. Massal.	Ric. Auton. Lich. Crost.: 79 (1852)	Mal
711	Catillariaceae	Catillaria	<i>lenticularis</i>			(Ach.) Th. Fr.	Lichenogr. Scand. 1: 567 (1874)	unknown
705	Bacidaceae	Calinaria	<i>atropurpurea</i>			(Schaer.) Vězda & Poelt	Bestimmungs. Eur. Flechten, Erg. 2: 363 (1981)	Esp
757	Parmeliaceae	Cetraria	<i>aculeata</i>			(Schreb.) Fr.	Nov. Sched. Critic. Lich.: 26 (1826)	
721	Coniocybaceae	Chaenotheca	<i>brunnea</i>			(Ach.) Müll. Arg.	Mém. Soc. Phys. Genève 16: 360 (1862)	unknown
721	Coniocybaceae	Chaenotheca	<i>carthusiae</i>			(Harm.) Lettau	Festschr. Preuss. Bot. Ver.: 27 (1912)	unknown
721	Coniocybaceae	Chaenotheca	<i>chlorella</i>			(Ach.) Müll. Arg.	Mém. Soc. Phys. Genève 16: 360 (1862)	unknown
721	Coniocybaceae	Chaenotheca	<i>ferruginea</i>			(Turner & Sm.) Migula	Krypt-Fl. Deutschl., Flecht. 2: 479 (1931)	unknown

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751	Mycocaliciaceae	<i>Chaenothecopsis</i>	<i>debilis</i>			(Turner & Borrer) Tibell	Symb. Bot. Upsal. 21: 45 (1975)	unknown
751	Mycocaliciaceae	<i>Chaenothecopsis</i>	<i>pusilla</i>			(Flörke) A. Schmidt.	Mitt. Staatsinst. Allg. Bot. Hamburg 13: 148 (1976)	unknown
757	Parmeliaceae	<i>Chondropsis</i>	<i>semiviridis</i>			(F. Muell. ex Nyl.) Nyl. in J.M. Crombie	J. Linn. Soc. Bot. 17: 397 (1879)	Coo, Nul, Mal, Aw
714	Chrysothricaceae	<i>Chrysothrix</i>	<i>candelaris</i>			(L.) J.R. Laundon	Lichenologist 13: 110 (1981)	Mur, Nk, Esp, Wa Jf, Mal
716	Cladoniaceae	<i>Cladia</i>	<i>agregata</i>			(Sw.) Nyl.	Compt. Rend. Hebd. Séances Acad. Sci. 83: 88 (1876)	Jf, Aw, Swa, War, Esp, Mal
716	Cladoniaceae	<i>Cladia</i>	<i>corallizon</i>			F. Wilson ex Filson	Victorian Naturalist 87: 324 (1970)	Mal, Aw
716	Cladoniaceae	<i>Cladia</i>	<i>ferdinandii</i>			(Müll. Arg.) Filson	Victorian Naturalist 87: 325 (1970)	Mal, Esp, Jf, War, Swa
716	Cladoniaceae	<i>Cladia</i>	<i>infata</i>			(F. Wilson) D.J. Galloway	Nova Hedwigia 28: 476 (1977)	unknown
716	Cladoniaceae	<i>Cladia</i>	<i>relipora</i>			(Labill.) Nyl.	Compt. Rend. Hebd. Séances Acad Sci 83: 88 (1876)	Aw, War
716	Cladoniaceae	<i>Cladia</i>	<i>schizopora</i>			(Nyl.) Nyl.	Rev. Bot. Bull. Mens. 6: 161 (1888)	War, Esp
716	Cladoniaceae	<i>Cladia</i>	<i>sulivanii</i>			(Müll. Arg.) W. Martin	Trans. Roy. Soc. New Zealand. Bot. 2: 44 (1962)	Aw, Swa
716	Cladoniaceae	<i>Cladonia</i>	<i>confusa</i>	f. <i>confusa</i>	see <i>Cladonia confusa</i>	(R. Sant.) Follmann & Ahl in G. Follmann	Philippia 4: 321 (1981)	Jf
716	Cladoniaceae	<i>Cladonia</i>	<i>angustata</i>			Nyl.	Ann. Sci. Nat. Bot. sér. 4, 11: 236 (1859)	War, Jf
716	Cladoniaceae	<i>Cladonia</i>	<i>calyciformis</i>			Nuno	J. Jap. Bot. 47: 161 (1972)	War, Jf
716	Cladoniaceae	<i>Cladonia</i>	<i>capitellata</i>	var. <i>capitellata</i>		(Hook. f. & Taylor) C. Bab. in J.D. Hooker	Fl. Nov. Zel. 2: 296 (1855)	War, Esp, Jf
716	Cladoniaceae	<i>Cladonia</i>	<i>capitellata</i>	var. <i>interfasciens</i>		(Nyl.) Sandst.	Repert. Spec. Nov. Regni Veg. Belh. 103: 36 (1938)	unknown
716	Cladoniaceae	<i>Cladonia</i>	<i>capitellata</i>	var. <i>squamulata</i>		A.W. Archer	Proc. Linn. Soc. New South Wales 108: 193 (1986)	War
716	Cladoniaceae	<i>Cladonia</i>	<i>cervicornis</i>	subsp. <i>verticillata</i>		(Hoffm.) Ahl	Lichenologist 12: 126 (1980)	Jf, War, Swa, Esp, Aw, Mal, Coo
716	Cladoniaceae	<i>Cladonia</i>	<i>chlorophaea</i>			(Flörke ex Sommerf.) Spreng in C. Immaeus	Syst. Veg. 16th edn, 4: 273 (1827)	Wa
716	Cladoniaceae	<i>Cladonia</i>	<i>confusa</i>		<i>Cladonia confusa</i> f. <i>confusa</i>	R. Sant.	Ark. Bot. 30A(10): 13 (1942)	Jf
716	Cladoniaceae	<i>Cladonia</i>	<i>crispata</i>			(Delise) Vain	Acta Soc. Fauna Fl. Fenn. 4: 392 (1887)	Wa, Esp, War
716	Cladoniaceae	<i>Cladonia</i>	<i>enantha</i>	var. <i>celtrantiformis</i>		Nyl. in W. von Zwackhoff-Holzhausen	Rev. Cladonia: 1 (1898)	Esp, War
716	Cladoniaceae	<i>Cladonia</i>	<i>fimbriata</i>			Fr.	Lichenogr. Eur. Reform.: 222 (1831)	War, Esp
716	Cladoniaceae	<i>Cladonia</i>	<i>floekeana</i>			(Fr.) Flörke	De Cladon.: 99 (1828)	War
716	Cladoniaceae	<i>Cladonia</i>	<i>globosa</i>			S. Hammer	Bryologist 104: 570 (2001*) [2002]	War
716	Cladoniaceae	<i>Cladonia</i>	<i>humilis</i>	var. <i>humilis</i>		(Witt.) J.R. Laundon	Lichenologist 16: 220 (1984)	War
716	Cladoniaceae	<i>Cladonia</i>	<i>imbricata</i>			S. Hammer	Bryologist 104: 571 (2001*) [2002]	War
716	Cladoniaceae	<i>Cladonia</i>	<i>kremplhuberi</i>			(Vain.) Zahlbr.	Cat. Lic. Univ. 4: 552 (1927)	War, Jf

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716	Cladoniaceae	Cladonia	imaculenta			Hoffm.	Deutschl. Fl. 2: 126 (1796)	War, Swa
716	Cladoniaceae	Cladonia	merochlorophaea			Asah.	J. Jap. Bot. 16: 713 (1940)	War
716	Cladoniaceae	Cladonia	nudicaulis			S. Hammer	Bryologist 104: 572 ('2001') [2002]	
716	Cladoniaceae	Cladonia	ochrochlora			Flörke	De Cladon.: 75 (1828)	War
716	Cladoniaceae	Cladonia	pleurota			(Flörke) Schaer.	Enum. Crit Lich. Eur.: 186 (1850)	War, Esp
716	Cladoniaceae	Cladonia	praetermissa			A.W. Archer	Muelleria 5: 273 (1984)	unknown
716	Cladoniaceae	Cladonia	ramulosa			(With.) J.R. Laundon	Lichenologist 16: 225 (1984)	Jf, War
716	Cladoniaceae	Cladonia	rigida	var. acuta		(Taylor) A.W. Archer	Muelleria 7: 175 (1990)	War
716	Cladoniaceae	Cladonia	rigida	var. rigida		(Hook.f. & Taylor) Hampe	Linnaea 28: 216 (1856)	War, Esp
716	Cladoniaceae	Cladonia	scabriuscula			(Delise) Nyl.	Compt. Rend. Hebd. Séances. Acad. Sci. 83: 88 (1876)	unknown
716	Cladoniaceae	Cladonia	southlandica			W. Martin	Trans. Roy. Soc. New Zealand, Bot. 2: 42 (1962)	Esp, Swa
716	Cladoniaceae	Cladonia	subradiata			(Vain.) Sandst.	Abh. Naturwiss. Vereine Bremen 25: 230 (1922)	War
716	Cladoniaceae	Cladonia	sulcata	var. striata		A.W. Archer	Muelleria 6: 386 (1987)	War
716	Cladoniaceae	Cladonia	subcata	var. wilsonii		(A.W. Archer) A.W. Archer & J.K. Bartlett	New Zealand J. Bot. 24: 583 (1986)	unknown
716	Cladoniaceae	Cladonia	tessellata			Ahli & Kashiw. in H. Inoue (ed.)	Crypt. S. Chile: 145 (1984)	Jf, Swa, Esp, Aw, War
735	Lecanoraceae	Clauzadeana	macula			(Taylor) Coppins & Rambold	Biblioth. Lichenol. 34: 85 (1989)	unknown
718	Coccocarpiaceae	Coccocarpia	erythrochili			(Spreng.) Swinscow & Krog	Norweg. J. Bot. 23: 254 (1976)	War Aw
718	Coccocarpiaceae	Coccocarpia	palmicola			(Spreng.) Arv. & D.J. Galloway	Bot. Not. 132: 242 (1979)	
718	Coccocarpiaceae	Coccocarpia	pellita			(Ach.) Müll. Arg.	Symb. Bot. Upsal. 12(1): 420 (1952)	Nk
720	Collemlaceae	Collema	coccophorum			Tuck.	Proc. Amer. Acad. Arts 5: 385 (1862)	Mur, Co, Os
720	Collemlaceae	Collema	dunietzii			Degel.	Symb. Bot. Upsal. 20(20): 98 (1974)	
720	Collemlaceae	Collema	implicatum			Nyl.	Acta Soc. Sci. Fenn. 7: 428 (1863)	unknown
720	Collemlaceae	Collema	leucocarpum			(Hook.f. & Taylor)	London J. Bot. 3: 657 (1844)	unknown
720	Collemlaceae	Collema	subconveniens			Nyl.	Lich. Nov. Zel.: 8 (1888)	War
709	Caliciaceae	Cyphelium	trachylloides			(Nyl.) Eriksen ex Keissl.	Rabenh. Krypt. Fl. 9(1), 2: 784 (1938)	unknown
756	Pannariaceae	Degelia	flabellata			P.M. Jorg & P. James	Biblioth. Lichenol. 38: 269 (1990)	Jf, War
756	Pannariaceae	Degelia	subcrustata			P.M. Jorg & Kantvilas in Jorgensen et al.	Lichenologist 32: 260 (2000)	
764	Physciaceae	Dimelaena	australensis			H. Mayrhofer & Sheard in J.W. Sheard & H. Mayrhofer	Bryologist 87: 247 (1984)	unknown
764	Physciaceae	Dimelaena	elevata			Elis, Kalb & Wippel	Mycotaxon 58: 298 (1996)	Nk
764	Physciaceae	Dimelaena	tenuis			(Müll. Arg.) H. Mayrhofer	Mycotaxon 58: 304 (1996)	

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						& Wippl in Mayrhofer et al.		
764	Physciaceae	<i>Diploicia</i>	<i>canescens</i>			(Dicks.) A. Massal.	Ric Auton, Lich. Crost.: 86 (1852)	Jf Gs
803	Thelotremales	<i>Diploschistes</i>	<i>actinostomus</i>			(Pers.) Zahlbr.	Hedwigia 31: 34 (1892)	Nk
803	Thelotremales	<i>Diploschistes</i>	<i>albomii</i>			C.W. Dodge	Beih. Nova. Hedwigia 12: 106 (1964)	
803	Thelotremales	<i>Diploschistes</i>	<i>diploschistoides</i>			(Vain.) Salisbury	Lichenologist 5: 273 (1972)	
803	Thelotremales	<i>Diploschistes</i>	<i>euganeus</i>			(A. Massal.) J. Steiner	Verh. Zool.-Bot. Ges. Wien 69: 96 (1919)	Esp Gs
803	Thelotremales	<i>Diploschistes</i>	<i>gypsaecus</i>			(Ach.) Zahlbr.	Hedwigia 31: 35 (1892)	unknown
803	Thelotremales	<i>Diploschistes</i>	<i>hensseniae</i>			Lumbsch & Elix	Pl. Syst. Evol. 150: 276 (1987)	Coo Mur Aw
803	Thelotremales	<i>Diploschistes</i>	<i>muscorum</i>	subsp. <i>bartleii</i>		Lumbsch	Herzogia 7: 602 (1987)	Gs
803	Thelotremales	<i>Diploschistes</i>	<i>ocellatus</i>			(Vill.) Norman	Nyrt Mag. Naturvidensk 7: 232 (1853)	Mur Aw Coo Car Swa Gs
803	Thelotremales	<i>Diploschistes</i>	<i>scruposus</i>			(Schreb.) Norman	Nyrt Mag. Naturvidensk 7: 232 (1853)	Mur Coo Aw
803	Thelotremales	<i>Diploschistes</i>	<i>strictus</i>			(Korb.) Müll. Arg.	Bull. Herb. Boissier 2, Append. 1: 52 (1894)	Nk
803	Thelotremales	<i>Diploschistes</i>	<i>thunbergianus</i>		<i>Diploschistes australasicus</i>	Lumbsch & Vezda	Nova Hedwigia 56: 234 (1993)	Mal Aw Coo
764	Physciaceae	<i>Diplomma</i>	<i>alboatrum</i>		<i>Buellia alboatra</i>	(Hoffm.) Flot.	Uebers. Arbeiten Veränd. Schles. Ges. Vaterl. Cult. 27: 130 (1849)	Car
764	Physciaceae	<i>Dirinaria</i>	<i>aegialita</i>			(Ach.) Moore	Bryologist 71: 248 (1968)	Nk
764	Physciaceae	<i>Dirinaria</i>	<i>applanata</i>			(Fée) Awasthi	J. Indian Bot. Soc. 49: 135 (1970)	Di
764	Physciaceae	<i>Dirinaria</i>	<i>batavica</i>			Awasthi	Biblioth. Lichenol. 2: 42 (1975)	Nk Vb Ovp
764	Physciaceae	<i>Dirinaria</i>	<i>confluens</i>			(Fr.) Awasthi	Biblioth. Lichenol. 2: 281 (1975)	Di Car Nk
764	Physciaceae	<i>Dirinaria</i>	<i>picta</i>			(Sw.) Schaer. ex Clem.	Gen. Fung.: 323 (1931)	Di
727	Graphidaceae	<i>Dyptolabia</i>	<i>afzelii</i>		<i>Graphis afzelii</i>	(Ach.) A. Massal.	Neag. Lich.: 6 (1854)	Mur, Aw
795	Verrucariaceae	<i>Endocarpon</i>	<i>aridum</i>			P.M. McCarthy	Lichenologist 23: 28 (1991)	Mur
795	Verrucariaceae	<i>Endocarpon</i>	<i>crassisporum</i>			P.M. McCarthy & Filson	Lichenologist 23: 31 (1991)	Jf
795	Verrucariaceae	<i>Endocarpon</i>	<i>helmsianum</i>			Müll. Arg.	Hedwigia 31: 197 (1892)	Mur
795	Verrucariaceae	<i>Endocarpon</i>	<i>macrosporum</i>			P.M. McCarthy	Lichenologist 23: 35 (1991)	unknown
795	Verrucariaceae	<i>Endocarpon</i>	<i>pallidum</i>			Ach.	Lichenogr. Universalis: 301 (1810)	Di
795	Verrucariaceae	<i>Endocarpon</i>	<i>pusillum</i>			Hedwig.	Descr. Micr.-Anal. Musc. Frond. 2: 56 (1789)	Coo Mur
795	Verrucariaceae	<i>Endocarpon</i>	<i>robustum</i>			P.M. McCarthy	Lichenologist 23: 41 (1991)	unknown
795	Verrucariaceae	<i>Endocarpon</i>	<i>simplicatum</i>	var. <i>bisporum</i>		P.M. McCarthy	Lichenologist 23: 48 (1991)	unknown
795	Verrucariaceae	<i>Endocarpon</i>	<i>simplicatum</i>	var. <i>simplicatum</i>		(Nyl.) Nyl. in A.M. Hue	Rev. Bot. Courrensens 6: 104 (1888)	Mal Mur Esp
740	Lichnaceae	<i>Ephebe</i>	<i>lanata</i>			(L.) Vain	Meddeland. Soc. Fauna Fl. Fenn. 14: 20 (1888)	Aw Esp Jf
757	Parmeliaceae	<i>Flavoparmelia</i>	<i>diffracta</i>			Elix & J. Johnst.	Mycotaxon 33: 391 (1988)	unknown
757	Parmeliaceae	<i>Flavoparmelia</i>	<i>ferax</i>			(Müll. Arg.) Hale	Mycotaxon 25: 604 (1986)	Mur Mal Jf
757	Parmeliaceae	<i>Flavoparmelia</i>	<i>haysonii</i>			(C.W. Dodge) Hale	Mycotaxon 25: 605 (1986)	War Esp Jf
757	Parmeliaceae	<i>Flavoparmelia</i>	<i>proeuplecta</i>			Elix & J. Johnst.	Mycotaxon 33: 395 (1988)	unknown

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757	Parmeliaceae	Flavoparmelia	rutidota			(Hook. f. & Taylor) Hale	Mycotaxon 25: 605 (1986)	Coo Swa Jf Mal Gs Aw Nul Esp Mur
757	Parmeliaceae	Flavoparmelia	seabrosina			Elix & J. Johnst.	Mycotaxon 33: 396 (1988)	unknown
757	Parmeliaceae	Flavoparmelia	secalonica			Elix & J. Johnst.	Mycotaxon 33: 398 (1988)	unknown
757	Parmeliaceae	Flavoparmelia	soredians			(Nyl.) Hale	Mycotaxon 25: 605 (1986)	Swa Esp Jf Nul
757	Parmeliaceae	Flavoparmelia	springtonensis			(Elix) Hale	Mycotaxon 25: 605 (1986)	unknown
766	Teloschistaceae	Fulgensia	bracteata			(Hoffm.) Räsänen	Flecht. Est. 1: 108 (1931)	Gs Mur Swa
766	Teloschistaceae	Fulgensia	subbracteata			(Nyl.) Poelt	Sched. Lich. Alp.: 137 (1961)	Coo Mal Swa
730	Heppiaceae	Gloeoheppia	turgida			(Ach.) Gyeln.	Repert. Spec Nov Regni Veg. 38: 312 (1935)	Ck
727	Graphidaceae	Graphis	afzelii		see <i>Diplolabia afzelii</i>	Ach.	Syn. Meth. Lich.: 85 (1814)	Mur Aw
727	Graphidaceae	Graphis	anfractuosa			(Eschw.) Eschw. in Marius	Fl. Bras. Enum. Pl. 1: 86 91833	
727	Graphidaceae	Graphis	inamoena			Zahlbr.	Ann. Cryptog. Exot. 1: 126 (1928)	
727	Graphidaceae	Graphis	scripta			(Wigg.) Ach.	Kongl. Vetensk. Akad. Nya Handl. 28: 145 (1809)	Esp
735	Lecanoraceae	Haematomma	eremaeum		misappl. to <i>Lichenostigma hyalospora</i>	R.W. Rogers	Lichenologist 14: 124 (1982)	Coo Mal Mur Aw Esp
735	Lecanoraceae	Haematomma	similis			Bagl.	Nuovo Giorn. Bot. Ital. 7: 248 (1875)	unknown
735	Lecanoraceae	Haematomma	sorediatum			R.W. Rogers	Lichenologist 14: 128 (1982)	War
764	Physciaceae	Hafellia	disciformis		<i>Buellia disciformis</i>	(Fr.) Marbach & H. Mayrhofer in Marbach	Biblioth. Lichenol. 4: 259 (2000)	
764	Physciaceae	Hafellia	disca			(Sirt.) H. Mayrhofer & Sheard in Sheard	Bryologist 95: 87 (1992)	
764	Physciaceae	Hafellia	reagens			Pusswald in Marbach	Biblioth. Lichenol. 74: 281 (2000)	
764	Physciaceae	Hafellia	tetrapla			(Nyl.) Pusswald in Marbach	Biblioth. Lichenol. 74: 286(2000)	
730	Heppiaceae	Heppia	despreauxii			(Mont.) Tuck.	Gen. Lich.: 46 (1872)	Nk
730	Heppiaceae	Heppia	lutosa			(Ach.) Nyl.	Syn. Meth. Lich. 2: 45 (1863)	Mur
716	Cladoniaceae	Heterodea	beauleholei			Filson	Lichenologist 10: 18 (1978)	Coo Mur Gas Aw
716	Cladoniaceae	Heterodea	muelleri			(Hampe) Nyl.	Bull. Soc. Lim. Normandie, sér. 2: 2: 47 (1867)	Mur Coo Esp Aw Gs Yal Swa Jf War Mel.
764	Physciaceae	Heterodermia	denticulica			(Pers.) Poelt	Nova Hedwigia 9: 31 (1965)	unknown
764	Physciaceae	Heterodermia	japonica			(Sato) Swinscow & Krog	Lichenologist 8: 122 (1976)	Aw
764	Physciaceae	Heterodermia	microphylla		misappl. = <i>H. obscurata</i>	(Kurok.) Swinscow & Krog	Lichenologist 8: 132 (1976)	War
764	Physciaceae	Heterodermia	obscurata			(Nyl.) Trevis.	Nuovo Giorn. Bot. Ital. 1: 114 (1869)	War Esp Jf Swa
764	Physciaceae	Heterodermia	speciosa			(Wulfen) Trevis.	Atti Soc. Ital. Sci. Nat. 11: 614 (1869)	unknown
764	Physciaceae	Hyperphyscia	adglutinata			(Flörke) H. Mayrhofer & Poelt	Herzogia 5: 62 (1979)	Mur Coo
763	Phyllopsoraceae	Hypocnemomyce	australis			Timdal	Nordic J. Bot. 4:95 (1984)	unknown

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763	Phyllopsoraceae	Hypocenomyce	foveata			Timbal	Noodie J. Bot. 4: 98 (1984)	War
763	Phyllopsoraceae	Hypocenomyce	scalaris			(Ach.) M. Choisy	Bull. Mens. Soc. Linn. Soc. Bot. Lyon 22: 103 (1953)	unknown
757	Parmeliaceae	Hypogymnia	lugubris			(Pers.) Krog	Norsk Polarinst. Skr. 144: 99 (1968)	unknown
757	Parmeliaceae	Hypogymnia	pulchritabata			(Blitter) Elix	Brunonia 2: 214 (1979)	Mal AW Esp
757	Parmeliaceae	Hypogymnia	pulverulata			(Nyl.) Elix	Brunonia 2: 217 (1979)	War Jf
757	Parmeliaceae	Hypogymnia	subphysodes	var. <i>austerodioides</i>		Elix	Brunonia 2: 230 (1979)	War Jf Swa
757	Parmeliaceae	Hypogymnia	subphysodes	var. <i>subphysodes</i>		(Kremp.) Filson	Victorian Naturalist 87: 325 (1970)	War Jf Swa Esp
757	Parmeliaceae	Hypotrachyna	revoluta			(Flörke) Hale	Smithsonian Contr. Bot. 25: 60 (1975)	
757	Parmeliaceae	Imshaugia	aleurites			(Ach.) S.L. Mey.	Mycologia 77: 338 (1965)	Jf
795	Verrucariaceae	Lauderhindsaya	borreni			(Tul.) J.C. David & D. Hawksw.	Sydowia 41: 116 (1989)	unknown
705	Bacidiaceae	Lecania	erysibe			(Ach.) Mudd	Man. Brit. Lich.: 141 (1861)	unknown
705	Bacidiaceae	Lecania	turicensis			(Hepp.) Müll. Arg., Zahlbr.	Cat. Lic. Univ. 5: 749 (1928)	Swa
735	Lecanoraceae	Lecanora	arafurensis			Lumbsch & Elix	Mycotaxon 67: 392 (1996)	
735	Lecanoraceae	Lecanora	arhemica			Lumbsch	J. Hattori Bot. Lab. 77: 68 (1994)	unknown
735	Lecanoraceae	Lecanora	austrointumescens			Lumbsch & Elix	Mycotaxon 67: 393 (1998)	
735	Lecanoraceae	Lecanora	austrosorediosa		<i>Biatora sorediosa</i>	(Rambold) Lumbsch	Australas. Lichenol. 45: 10 (1999)	unknown
735	Lecanoraceae	Lecanora	caesonrubella			Ach.	Lichenogr. Universalis: 366 (1810)	unknown
735	Lecanoraceae	Lecanora	elphelia			Stizenb.	Ber. Tägk. St. Gallischen. Naturwiss. Ger. 1888-89: 220 (1890)	unknown
735	Lecanoraceae	Lecanora	expallens			Ach.	Lichenogr. Universalis: 374 (1810)	unknown
735	Lecanoraceae	Lecanora	farrinacea			Fée	Essai Crypt. écorc.: 117 (1824)	Jf Esp
735	Lecanoraceae	Lecanora	flavidomarginata			de Lesd.	Lich. Mexique: 14 (1914)	Aw
735	Lecanoraceae	Lecanora	flavopallida			Stirt.	J. Linn. Soc. Bot. 14: 463 (1875)	unknown
735	Lecanoraceae	Lecanora	helva			Stizenb.	Ber. Tägk. St. Gallischen. Naturwiss. Ger. 1888-89: 218 (1890)	unknown
735	Lecanoraceae	Lecanora	leprosa			Fée	Essai Crypt. écorc.: 118 (1824)	
735	Lecanoraceae	Lecanora	lividocinerea			Bagl.	Nuovo Giom. Bot. Ital. 11: 75 (1879)	Swa
735	Lecanoraceae	Lecanora	mayrhoferi			Lumbsch in H.T. Lumbsch et al.	Bot. Acta 107: 33 (1993)	unknown
735	Lecanoraceae	Lecanora	mobergiana			Lumbsch & Elix	Mycotaxon 67: 398 (1998)	
735	Lecanoraceae	Lecanora	pallida			(Schreb.) Rabenh.	Deutschl. Krypt.-Fl. 2: 34 (1845)	unknown
735	Lecanoraceae	Lecanora	plumosa			Müll. Arg.	Flora 65: 484 (1882)	unknown
735	Lecanoraceae	Lecanora	pseudistera			Nyl.	Flora 55: 354 (1872)	unknown
735	Lecanoraceae	Lecanora	rupicola			(L.) Zahlbr.	Cat. Lich. Univ. 5: 525 (1928)	Esp
735	Lecanoraceae	Lecanora	sphaerospora			Müll. Arg.	Hedwigia 31: 196 (1892)	Gs Mur Swa

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
735	Lecanoraceae	Lecanora	subimmersa			(Fee) Vain.	Eucl. Class. Lich. Brésil 1: 98 (1890)	unknown
735	Lecanoraceae	Lecanora	tropica			Zahlbr.	Cat. Lich. Univ. 5: 589 (1928)	unknown
735	Lecanoraceae	Lecanora	atra		see <i>Tephromelia atra</i>			
736	Lecideaceae	Lecidea	capensis			Zahlbr.	Cat. Lich. Univ. 3: 532 (1925)	unknown
736	Lecideaceae	Lecidea	contigua			(Hoffm.) Fr.	Nov. Sched. Critic. Lich.: 14 (1827)	unknown
736	Lecideaceae	Lecidea	fuscostrula			Nyl.	Lich. Nov. Zel.: 106 (1888)	unknown
736	Lecideaceae	Lecidea	globifera			Ach.	Methodus: 213 (1803)	Mur
736	Lecideaceae	Lecidea	hypnorum			Libert in A.B. Massalongo	Mem. Lichenogr. 124 (1853)	unknown
736	Lecideaceae	Lecidea	laeta		see <i>Pyrrophora laeta</i>			
736	Lecideaceae	Lecidea	multiflora			Taylor	London J. Bot. 6: 149 (1847)	unknown
736	Lecideaceae	Lecidea	ochroleuca			Pers. in C. Gaudichaud	Voy. Uranie: 193 (1826)	Coo Gs
736	Lecideaceae	Lecidea	sarcogynoides			Körb.	Syst. Lich. Germ.: 252 (1855)	Jf
736	Lecideaceae	Lecidea	terrena			Nyl.	J. Linn. Soc. Bot. 15: 177 (1876)	Pil
736	Lecideaceae	Lecidea	tragorum			Zahlbr.	Ann. Mycol. 34: 168 (1936)	unknown
736	Lecideaceae	Lecidea	varians			Ach.	Syn. Meth. Lich.: 38 (1814)	unknown
736	Lecideaceae	Lecidea	stigmalea			(Ach.) Hertel & Leuckert	Willdenowia 5: 375 (1969)	unknown
735	Lecanoraceae	Lecidella	sublapidica			(C. Knight) Hertel	Mitt. Bot. Staatssamml. München 19: 444 (1983)	unknown
805	Deuteromycotina	Leparia	chlorina			Ach., Zahlbr.	Cat. Lich. Univ. 7: 759 (1931)	Esp
805	Deuteromycotina	Leparia	incana			(L.) Ach.	Lichenogr. Suec. Prodr.: 7 (1798)	Esp Nk
805	Deuteromycotina	Leprocaulon	microscopicum			(Vill.) Gams ex D. Hawksw.	Kl. Kryptogamenfl. 3: 113 (1967)	Jf Aw
756	Pannariaceae	Leproloma	membranaceum			(Dicks.) Vain	Természetrajzi Füzet. 22: 293 (1899)	Esp Nk
720	Collemataceae	Leptogium	azureum			(Sw. ex Ach.) Mont. in P.B. Webb & S. Berthelot	Hist. Nat. Iles Canaries 3: 129 (1840)	Esp
720	Collemataceae	Leptogium	corniculatum			(Hoffm.) Minks	Floralische Z. Naturwiss. 35: 353 (1873)	unknown
720	Collemataceae	Leptogium	menziesii			(Sm.) Mont.	Ann. Sci. Nat. Bot. sér. 3: 18: 313 (1852)	unknown
720	Collemataceae	Leptogium	phyllocarpum			(Pers.) Mont.	Ann. Sci. Nat. Bot., sér. 3: 10: 134 (1848)	unknown
738	Letroitaceae	Letroitia	domingensis			(Pers.) Hafellner & Bellem.	Nova Hedwigia 35: 281 (1982)	unknown
739	Lichenotheliaceae	Lichenostigma	hyalospora			see <i>Haematomma eremaeum</i>		Mal
739	Lichenotheliaceae	Lichenothelia	acuparia			(Nyl.) D. Hawksw.	Lichenologist 13: 142 (1981)	unknown
739	Lichenotheliaceae	Lichenothelia	solitarioides			Henssen	Biblioth. Lichenol. 25: 262 (1978)	unknown
740	Lichinaceae	Lichina	minutissima			Henssen	Lichenologist 5: 449 (1973)	unknown
744	Megalariaceae	Megalara	grossa			(Pers. Ex Nyl.) Hafellner	Beih. Nova Hedwigia 79: 302 (1984)	War Jf
745	Megalosporaceae	Megalospora	occidentalis			Kanvilas	Lichenologist 26: 351 (1994)	War
757	Parmeliaceae	Menegazzia	caesiopulvinosa			P. James in G. Kantvilas	Lichenologist 19: 25 (1987)	Jf War

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority & P.W. James	Literature	IBRA regions
757	Parmeliaceae	<i>Menegazzia</i>	<i>fertilis</i>			P. James in P.W. James & D. J. Galloway	Fl. Australia 54: 312 (1992)	War
757	Parmeliaceae	<i>Menegazzia</i>	<i>platyrema</i>			(Müll. Arg.) R. Sant.	Ark. Bot. 30A (11): 13 (1942)	War Jf Aw
757	Parmeliaceae	<i>Menegazzia</i>	<i>subpertusa</i>			P. James & D.J. Galloway in Galloway	New Zealand J. Bot. 21: 195 (1983)	
748	Microcaliciaceae	<i>Microcalicium</i>	<i>conversum</i>			Tibell	Bot. Not. 131: 237 (1978)	unknown
751	Mycocaliciaceae	<i>Mycocalicium</i>	<i>alborigicum</i>			(Nyl.) Tibell	Lichenologist 14: 238 (1982)	Swa
751	Mycocaliciaceae	<i>Mycocalicium</i>	<i>subtile</i>			(Pers.) Szat.	Magyar Bot. Lapok 24: 47 (1926)	unknown
751	Mycocaliciaceae	<i>Mycocalicium</i>	<i>victoriae</i>			(C. Knight ex F. Wilson) Tibell	Beih. Nova Hedwigia 79: 672 (1984)	War
752	Mycoporaceae	<i>Mycoporium</i>	<i>quercus</i>			(A. Massal.) Müll. Arg.	Flora 65: 402 (1882)	War
757	Parmeliaceae	<i>Neofuscella</i>	<i>archeri</i>			Elix	Mycotaxon 63: 422 (1997)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>atrobarbata</i>			(Elix) Essl.	Bryologist 89: 297 (1987)	War
757	Parmeliaceae	<i>Neofuscella</i>	<i>brattii</i>			(Essl.) Essl.	Mycotaxon 7: 49 (1978)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>chudalupensis</i>			Elix	Mycotaxon 21: 435 (1999)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>convexa</i>			Elix	Mycotaxon 65: 485 (1997)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>glabrans</i>			(Nyl.) Essl.	Mycotaxon 7: 50 (1978)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>imitatrix</i>			(Taylor) Essl.	Mycotaxon 7: 50 (1978)	Aw Jf Coo
757	Parmeliaceae	<i>Neofuscella</i>	<i>incantata</i>			(Essl.) Essl.	Mycotaxon 7: 50 (1978)	Coo Aw Mur
757	Parmeliaceae	<i>Neofuscella</i>	<i>kondininensis</i>			Elix	Mycotaxon 47: 110 (1993)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>loxodella</i>			(Essl.) Essl.	Mycotaxon 7: 51 (1978)	Aw Esp Coo
757	Parmeliaceae	<i>Neofuscella</i>	<i>luteonolata</i>			(J. Steiner) Essl.	Mycotaxon 7: 51 (1978)	Coo
757	Parmeliaceae	<i>Neofuscella</i>	<i>parviboba</i>			(Essl.) Essl.	Mycotaxon 7: 51 (1978)	
757	Parmeliaceae	<i>Neofuscella</i>	<i>pulla</i>			(Ach.) Essl.	Mycotaxon 7: 52 (1978)	Jf Esp Aw Coo Gs
757	Parmeliaceae	<i>Neofuscella</i>	<i>remmanii</i>			Elix	Mycotaxon 59: 407 (1996)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>scabrosina</i>			Elix	Mycotaxon 47: 112 (1993)	Mal
757	Parmeliaceae	<i>Neofuscella</i>	<i>squamariatella</i>			Elix	Mycotaxon 71: 448 (1999)	
757	Parmeliaceae	<i>Neofuscella</i>	<i>subbarbata</i>			Elix	Mycotaxon 47: 114 (1993)	unknown
757	Parmeliaceae	<i>Neofuscella</i>	<i>subimitatrix</i>			(Essl.) Essl.	Mycotaxon 7: 53 (1978)	Aw Jf
757	Parmeliaceae	<i>Neofuscella</i>	<i>subincerta</i>			(Essl.) Essl.	Mycotaxon 7: 53 (1978)	
757	Parmeliaceae	<i>Neofuscella</i>	<i>subprolixa</i>			(Nyl. Ex Kremp.) Elix	Mycotaxon 71: 455 (1999)	
757	Parmeliaceae	<i>Neofuscella</i>	<i>verrucella</i>			(Essl.) Essl.	Mycotaxon 7: 53 (1978)	Coo Mur
805	Deuteromycotina	<i>Normandina</i>	<i>pulchella</i>			(Borrer) Nyl.	Ann. Sci. Nat. Bot. sér. 1, 4: 382 (1861)	War
760	Pertusariaceae	<i>Ochrolechia</i>	<i>pallascens</i>			(L.) A. Massal.	Nuovi. Ann. Sci. Nat. 7: 212 (1853)	Mur
760	Pertusariaceae	<i>Ochrolechia</i>	<i>parella</i>			(L.) A. Massal.	Ric. Auton. Lich. Crost.: 32 (1852)	Di Car
760	Pertusariaceae	<i>Ochrolechia</i>	<i>subthalina</i>			H. Magn.	Acta Horti Gothob. 13: 252 (1940)	Jf

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760	Pertusariaceae	Ochrolechia	subpallescens			Versgthy	Belh. Nova Hedwigia 1: 118 (1962)	Aw
760	Pertusariaceae	Ochrolechia	subhoditropa		<i>Pertusaria subhoditropa</i>	(A.W. Archer) K. Schmitz & Lumbsch in Schmitz et al.	Acta. Bot. Fern. 150: 160 (1994)	
1065	Tricholomataceae	Omphalina	chromacea			(Cleland) T.W. May & A.E. Wood	Mycotaxon 54: 148 (1995)	War Jf Swa
1065	Tricholomataceae	Omphalina	umbellifera			(L.: Fr.) Quél.	Enchir. Fung. 44 (1886)	War Esp
756	Pannariaceae	Pannaria	elixii			P.M. Jørg. & D.J. Galloway	Fl. Australia 54:315 (1992)	Esp War
756	Pannariaceae	Pannaria	lurida			(Mont.) Nyl.	Mém. Soc. Sci. Nat. Cherbourg 5: 109 (1857)	Swa
756	Pannariaceae	Pannaria	obscura			Müll. Arg.	Bull. Herb. Boissier 4: 91 (1895)	War
756	Pannariaceae	Pannaria	spicifera			(Mont.) Hue	Bull. Soc. Bot. France 48: 56 ('1901') [1902]	War Jf
757	Pannariaceae	Pannoparmelia	willsonii			(Räsänen) D.J. Galloway	New Zealand J. Bot. 16: 267 (1978)	unknown
757	Pannariaceae	Paraparmelia	arida			Elix & J. Johnst.	Brunonia 9: 139 (1986)	unknown
757	Pannariaceae	Paraparmelia	atrocapnodes			Elix & J. Johnst.	Brunonia 9: 141 (1986)	unknown
757	Pannariaceae	Paraparmelia	bourgeana			Elix	Mycotaxon 59: 410 (1996)	unknown
757	Pannariaceae	Paraparmelia	conanensis			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Mycotaxon 27: 280 (1986)	War
757	Pannariaceae	Paraparmelia	crawfordensis			Elix	Biblioth. Lichenol. 80: 78 (2001)	
757	Pannariaceae	Paraparmelia	inconspicua			Elix	Mycotaxon 59: 411 (1996)	unknown
757	Pannariaceae	Paraparmelia	inselbergia			Elix	Mycotaxon 59: 412 (1996)	unknown
757	Pannariaceae	Paraparmelia	lumbschii			Elix	Mycotaxon 59: 413 (1996)	unknown
757	Pannariaceae	Paraparmelia	mongaensis			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Mycotaxon 27: 280 (1986)	Esp
757	Pannariaceae	Paraparmelia	neointaria			(Hale) Elix & J. Johnst. in J.A. Elix et al.	Mycotaxon 27: 280 (1986)	Mur
757	Pannariaceae	Paraparmelia	saginata			Elix & J. Johnst.	Brunonia 9: 148 (1986)	unknown
757	Pannariaceae	Paraparmelia	sammyi			Elix & J. Johnst.	Mycotaxon 32: 408 (1988)	unknown
757	Pannariaceae	Paraparmelia	sergentii			Elix & J. Johnst.	Mycotaxon 32: 410 (1988)	unknown
757	Pannariaceae	Paraparmelia	subulpha			Elix & J. Johnst.	Brunonia 9: 149 (1986)	unknown
767	Porpidiaceae	Paraporphidia	glauca		<i>Lecidea glauca</i>	(Taylor) Rambold	Biblioth. Lichenol. 34: 246 (1989)	Nk Ck Mur Cs Jf
767	Porpidiaceae	Paraporphidia	leptocarpa			(C. Bab. & Mitt.) Rambold & Hertel	Biblioth. Lichenol. 34: 250 (1989)	unknown
757	Parmeliaceae	Parmelia	cunninghamii			Cromb.	J. Linn. Soc. Bot. 15: 228 (1876)	Jf
757	Parmeliaceae	Parmelia	erumpens			Kurok	Lich. Rar. Crit. Exsicc. 2: 74 (1969)	War
757	Parmeliaceae	Parmelia	pellis		misidentified	specimen		Swa
756	Pannariaceae	Parmeliella	turfurea			P.M. Jørg.	Biblioth. Lichenol. 78: 127 (2001)	
756	Pannariaceae	Parmeliella	gymnochella			(Nyl.) Müll. Arg.	Bull. Herb. Boissier 2, Append. 1: 44 (1894)	

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756	Parmariaceae	<i>Parmeliella</i>	<i>nigrocincta</i>			(Mont.) Müll. Arg.	Flora 64:86 (1881)	
757	Parmeliaceae	<i>Parmelina</i>	<i>confabrosa</i>			(Hale) Elix & J. Johnst.	Brunonia 9: 159 (1986)	War Jf Nk
757	Parmeliaceae	<i>Parmelina</i>	<i>endoleuca</i>			(Taylor) Hale	Smithsonian Contr. Bot. 33: 27 (1976)	unknown
757	Parmeliaceae	<i>Parmelina</i>	<i>fabrosa</i>			(Zahlbr.) Elix & J. Johnst.	Brunonia 9: 160 (1986)	War
757	Parmeliaceae	<i>Parmelina</i>	<i>pseudorelicina</i>			(Jatta) Kantvilas & Elix	Muelleria 7: 513 (1992)	unknown
757	Parmeliaceae	<i>Parmelina</i>	<i>quercina</i>			(Wild.) Hale	Phytologia 28: 483 (1974)	Jf Mal Coo Esp Aw
757	Parmeliaceae	<i>Parmelinopsis</i>	<i>minarum</i>			(Vain.) Elix & Hale	Mycotaxon 29: 243 (1987)	
769	Pyrenulaceae	<i>Parmularia</i>	<i>microspora</i>			Müll. Arg.	Flora 70: 427 (1887)	unknown
757	Parmeliaceae	<i>Parmotrema</i>	<i>chinense</i>			(Osbeck) Hale & Ahti	Taxon 35: 133 (1986)	Jf Aw Swa War
757	Parmeliaceae	<i>Parmotrema</i>	<i>cooperi</i>			(J. Steiner & Zahlbr.) Sérus.	Bryologist 87: 4 (1984)	unknown
757	Parmeliaceae	<i>Parmotrema</i>	<i>praesorediosum</i>			(Nyl.) Hale	Phytologia 28: 338 (1974)	Ck Vb
757	Parmeliaceae	<i>Parmotrema</i>	<i>pseudonilgherrense</i>			(Asah.) Hale	Mycotaxon 5: 441 (1977)	Nk
757	Parmeliaceae	<i>Parmotrema</i>	<i>linclorum</i>			(Despr. ex Nyl.) Hale	Phytologia 28: 339 (1974)	Nk
758	Peltigeraceae	<i>Peltigera</i>	<i>didactyla</i>			(With.) J.R. Laundon	Lichenologist 16: 217 (1984)	Jf
758	Peltigeraceae	<i>Peltigera</i>	<i>dolichorrhiza</i>			(Nyl.) Nyl.	Lich. Nov. Zel.: 43 (1888)	unknown
758	Peltigeraceae	<i>Peltigera</i>	<i>polydactyla</i>			(Neck.) Hoffm.	Descr. Pl. Cl. Crypt. 1: 19 (1780)	Jf
759	Peltulaceae	<i>Peltula</i>	<i>bolanderi</i>			(Tuck.) Wetmore	Ann. Missouri Bot. Gard. 57: 179 (1970) [1971]	Ovp Vb Ck
759	Peltulaceae	<i>Peltula</i>	<i>clavata</i>			(Kremp.) Wetmore	Ann. Missouri Bot. Gard. 57: 181 (1970) [1971]	
759	Peltulaceae	<i>Peltula</i>	<i>cylindrica</i>			Wetmore	Ann. Missouri Bot. Gard. 57: 181 (1970)	Ck
759	Peltulaceae	<i>Peltula</i>	<i>euploca</i>			(Ach.) Poelt ex Ozenda & Glauxade	Les Lichens: 324 (1970)	Ck Vb Cvp Dl Nk
759	Peltulaceae	<i>Peltula</i>	<i>impressa</i>			(Vain.) Swinscow & Krog.	Norweg. J. Bot. 26: 219 (1979)	Ck
759	Peltulaceae	<i>Peltula</i>	<i>langei</i>			Büdel & Elix	Biblioth. Lichenol. 67: 3 (1997)	Ck
759	Peltulaceae	<i>Peltula</i>	<i>obscurans</i>			(Nyl.) Gyeln.	Repert. Spec. Nov. Regni Veg. 38: 308 (1935)	unknown
759	Peltulaceae	<i>Peltula</i>	<i>omphaliza</i>			(Nyl.) Wetmore	Ann. Missouri Bot. Gard. 57: 179 (1970)	Ck
759	Peltulaceae	<i>Peltula</i>	<i>patellata</i>			(Bagl.) Swinscow & Krog	Norw. J. Bot. 26: 221 (1979)	Coo Mur
759	Peltulaceae	<i>Peltula</i>	<i>placodizans</i>			(Zahlbr.) Wetmore	Ann. Missouri Bot. Gard. 57: 179 (1970)	Ck Nk Vb
759	Peltulaceae	<i>Peltula</i>	<i>radicata</i>			Nyl.	Ann. Sci. Nat. Bot. sér. 3: 20: 316 (1853)	unknown
759	Peltulaceae	<i>Peltula</i>	<i>rodriguesii</i>			(Cromb.) Büdel	Lichenologist 21: 293 (1989)	Vb
759	Peltulaceae	<i>Peltula</i>	<i>subglebosa</i>			(Müll. Arg.) Filson	Muelleria 6: 511 (1988)	unknown
759	Peltulaceae	<i>Peltula</i>	<i>zahlbruckneri</i>			(Hasse) Wetmore	Ann. Missouri Bot. Gard. 57: 205 (1970)	Ck
759	Peltulaceae	<i>Peltularia</i>	<i>flavicans</i>			Lamy	Bull. Soc. Bot. France 25: 427 (1878)	Esp Aw
760	Pertusariaceae	<i>Pertusaria</i>	<i>gibberosa</i>			Müll. Arg.	Flora 65: 486 (1882)	Mur Swa Mal Jf
760	Pertusariaceae	<i>Pertusaria</i>	<i>leioplacella</i>			Nyl.	Bull. Soc. Linn. Normandie, sér. 2: 2: 71 (1895)	DI
760	Pertusariaceae	<i>Pertusaria</i>	<i>leucostomoides</i>			Zahlbr.	Cat. Lic. Univ. 5: 172 (1928)	Jf Swa Esp

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760	Pertusariaceae	Pertusaria	<i>persulphurata</i>		see <i>Pertusaria xanthoplaca</i>	Müll. Arg.	Hedwigia 32: 125 (1893)	Nk
760	Pertusariaceae	Pertusaria	<i>pustulata</i>			(Ach.) Duby	Bot. Gall. 2(2): 673 (1830)	unknown
760	Pertusariaceae	Pertusaria	<i>remota</i>			A.W. Archer	Mycotaxon 41: 238 (1991)	Vb Ck Nk
760	Pertusariaceae	Pertusaria	<i>scaberula</i>			A.W. Archer	Mycotaxon 41: 240 (1991)	Nk
760	Pertusariaceae	Pertusaria	<i>subventrosa</i>			Malmé	Ark. Bot. 28A(9): 7 (1936)	Nk
760	Pertusariaceae	Pertusaria	<i>thiophaninica</i>			A.W. Archer	Mycotaxon 41: 246 (1991)	Gs Car
760	Pertusariaceae	Pertusaria	<i>thiospoda</i>			C. Knight	Trans. Linn. Soc. London, Bot. 2: 47 (1882)	Nk
760	Pertusariaceae	Pertusaria	<i>trachyspora</i>			(Müll. Arg.) A.W. Archer	Mycotaxon 41: 247 (1991)	Mal Jf Aw
760	Pertusariaceae	Pertusaria	<i>trimeria</i>			Müll. Arg.	Flora 65: 485 (1882)	Nk
760	Pertusariaceae	Pertusaria	<i>xanthoplaca</i>			Triebel & Rambold in D. Triebel et al.	Bryologist 98: 80 (1995)	unknown
735	Lecanoraceae	Phacopsis	<i>oxyspora</i>	var. <i>fusca</i>		Müll. Arg.	Flora 65: 504 (1882)	War
727	Graphidaceae	Phaeographis	<i>australensis</i>		see <i>Phaeographis mucronata</i>			War
727	Graphidaceae	Phaeographis	<i>mucronata</i>		<i>Phaeographis australensis</i>	(Slirt.) Zahlbr.	Cat. Lich. Univ. 2: 382 (1923)	War
764	Physciaceae	Phaeophyscia	<i>endococcinodes</i>			(Poelt) Essl.	Mycotaxon 7: 301 (1976)	unknown
764	Physciaceae	Phaeophyscia	<i>orbicularis</i>			(Necker) Moberg	Symb. Bot. Upsal. 22: 44 (1977)	Mur
740	Lichinaceae	Phloeopcecania	<i>australensis</i>			Henssen	Lich. Cyan. Et Fungi Sax. Exsicc. 2: 10 (1990)	unknown
764	Physciaceae	Physcia	<i>alipolia</i>		see <i>Physcia jackii</i>	(Ehrh. Ex Humb.) Fühnr.	Natyrhist. Topogr. Regensburg 2: 249 (1839)	Aw Nul Mur Coo Mal
764	Physciaceae	Physcia	<i>alba</i>			(Fée) Müll. Arg.	Rev. Mycol. (Toulouse) 9: 23 (1887)	Mur Mal
764	Physciaceae	Physcia	<i>albicans</i>		<i>Physcia albopolumbea</i>	(Pers.) J.W. Thomson	Bryologist 66: 73 (1963)	Swa Coo
764	Physciaceae	Physcia	<i>albata</i>		see <i>Physcia albata</i>	(Taylor) Nyl. in A.M. Hue	Nouv. Arch. Mus. Hist. Nat., sér. 2: 319 (1890)	unknown
764	Physciaceae	Physcia	<i>biziana</i>			(A. Massal.) Zahlbr.	Österr. Bot. Zeit. 51: 348 (1901)	No WA collections (E)
764	Physciaceae	Physcia	<i>caesia</i>		see <i>Physcia poncinsii</i>	(Hoffm.) Fühnr.	Naturhist. Topogr. Regensburg 2: 250 (1839)	
764	Physciaceae	Physcia	<i>jackii</i>		<i>Physcia alipolia</i>	Moberg	Biblioth. Lichenol. 78: 298 (2001)	
764	Physciaceae	Physcia	<i>nubila</i>		<i>Physcia caesia</i>	Moberg	Nordic. J. Bot. 10: 335 (1990)	
764	Physciaceae	Physcia	<i>poncinsii</i>			Hue	Bull. Soc. Bot. France 63, Mém. 28: 10 (1917)	Mur Aw Coo
764	Physciaceae	Physcia	<i>stellaris</i>			(L.) Nyl.	Acta Soc. Linn. Bordeaux 21: 307 (1856)	Swa
764	Physciaceae	Physcia	<i>subalbicans</i>		see <i>Punctelia subalbicans</i>			
764	Physciaceae	Physcia	<i>tribacia</i>	var. <i>tribacia</i>		(Ach.) Nyl..	Flora 62: 48 (1874)	Jf Aw Mur
764	Physciaceae	Physcia	<i>undulata</i>			Moberg	Nordic. J. Bot. 6: 862 (1986)	
764	Physciaceae	Physcia	<i>verrucosa</i>			Moberg	Nordic. J. Bot. 6: 862 (1986)	
764	Physciaceae	Physcia	<i>virella</i>			(Ach.) Flagey	Rev. Mycol. (Toulouse) 13: 110 (1891)	unknown

N ^o	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
764	Physciaceae	<i>Physconia</i>	<i>distorta</i>			(With.) J.R. Laundon	Lichenologist 16: 218 (1984)	No WA collections
764	Physciaceae	<i>Physconia</i>	<i>grisea</i>			(Lam.) Poelt	Nova Hedwigia 9: 30 (1965)	unknown
795	Verrucariaceae	<i>Placidium</i>	<i>pilosellum</i>			(Breuss) Breuss	Ann. Naturhist. Mus. Wein 98: 39 (1996)	Mur, Mal
795	Verrucariaceae	<i>Placidium</i>	<i>squamulosum</i>			(Ach.) O. Breuss	Ann. Naturhist. Mus. Wein 98: 39 (1996)	Nk, Mur, Gs, Coo, Gas, Car, Yal
308	Agariciaceae	<i>Placopsis</i>	<i>perrugosa</i>			(Nyl.) Nyl.	Lich. Nov. Zel.: 57 (1888)	War Jf
766	Placynthiaceae	<i>Placynthium</i>	<i>nigrum</i>			(Huds.) S.F. Gray	Nat. Arr. Brit. Pl.: 395 (1821)	Swa
797	Acarosporaceae	<i>Polysporina</i>	<i>simplex</i>		<i>Lecidea simplex</i>	(Davies) Vězda	Folia Geobot. Phytolax. 13: 399 (1978)	Yal, Coo
809	Porinaceae	<i>Porina</i>	<i>guentheri</i>			(Flot.) Zahlbr.	Cat. Lich. Univ. 1: 384 (1922)	unknown
809	Porinaceae	<i>Porina</i>	<i>kantvilasii</i>			P.M. McCarthy	Biblioth. Lichenol. 52: 62 (1993)	unknown
740	Lichinaceae	<i>Poroscyphus</i>	<i>kalbarrensis</i>			A. Henssen	Lichenes Cyanophilli et Fungi Saxicolae Exsiccati, Fasc II: 9 (1990)	GS
740	Lichinaceae	<i>Poroscyphus</i>	<i>lichinelloides</i>			A. Henssen	Symb. Bot. Upsal. 18: 68 (1963)	Jf
767	Porpidiaceae	<i>Porpidia</i>	<i>macrocarpa</i>			(DC.) Hertel & Schwab in H. Hertel	Beih. Nova Hedwigia 79: 437 (1984)	unknown
757	Parmeliaceae	<i>Protoparmelia</i>	<i>petraeoides</i>		see <i>Ramboldia petraeoides</i>			
742	Lobariaceae	<i>Pseudocyphellaria</i>	<i>aurata</i>			(Ach.) Vain.	Acta Soc. Fauna Fl. Fenn. 7: 183 (1890)	unknown
742	Lobariaceae	<i>Pseudocyphellaria</i>	<i>billardierei</i>			(Delise) Räsänen	Ann. Bot. Soc. Zool.-Bot. Fenn. "Vanamo" 2: 39 (1932)	unknown
742	Lobariaceae	<i>Pseudocyphellaria</i>	<i>crocata</i>			(L.) Vain.	Hedwigia 37: 34 (1898)	Jf
742	Lobariaceae	<i>Pseudocyphellaria</i>	<i>neglecta</i>			(Müll. Arg.) H. Magn.	Acta Horti Goehburg. 14: 30 (1940)	Esp War Jf Swa
768	Psoraceae	<i>Psora</i>	<i>crenata</i>			(Taylor) Reinke	Jahrb. Wiss. Bot. 28: 97 (1895)	
768	Psoraceae	<i>Psora</i>	<i>crystallicera</i>			(Taylor) Müll. Arg.	Flora 71: 140 (1888)	Nk Vb Ck
768	Psoraceae	<i>Psora</i>	<i>decipiens</i>			(Hedw.) Hoffm.	Descr. Pl. Cl. Crypt. 2: 68 (1794)	Aw Mur Gs Car Coo Swa Mal
756	Pannariaceae	<i>Psoroma</i>	<i>pholidotoides</i>		<i>Psoroma sphinctrinum</i>	(Nyl.) Trevis.	Lich. Veneta: 98 (1869)	
756	Pannariaceae	<i>Psoroma</i>	<i>sphinctrinum</i>		see <i>Psoroma pholidotoides</i>	(Mont.) Nyl.	Ann. Sci. Nat. Bot., sér. 4, 3: 181 (1855)	unknown
740	Lichinaceae	<i>Pterygiopsis</i>	<i>australensis</i>			Henssen	Lichenes Cyanophilli et Fungi Saxicolae Exsiccati, Fasc II: 9 (1990)	Gs
740	Lichinaceae	<i>Pterygiopsis</i>	<i>convoluta</i>			Henssen	Lichenes Cyanophilli et Fungi Saxicolae Exsiccati, Fasc II: 8 (1990)	Gs
757	Parmeliaceae	<i>Punctelia</i>	<i>pseudocoralloidea</i>			(Gyeln.) Elix & Kantvilas	Australas. Lichenol. 49: 14 (2001)	
757	Parmeliaceae	<i>Punctelia</i>	<i>subalbicans</i>		misidentified as <i>Physcia subalbicans</i>	(Sirt.) D.J. Galloway & Elix	New Zealand J. Bot. 22: 443 (1984)	Aw Mur War
757	Parmeliaceae	<i>Punctelia</i>	<i>subflava</i>			(Taylor) Elix & J. Johnst.	Mycotaxon 31: 501 (1988)	unknown
757	Parmeliaceae	<i>Punctelia</i>	<i>subrudecta</i>			(Nyl.) Krog	Nordic J. Bot. 2: 291 (1982)	Esp Jf
769	Pyrenulaceae	<i>Pyrenula</i>	<i>cruenta</i>			(Mont.) Vain.	Étud. Class. Lich. Brésil 2: 197 (1890)	
769	Pyrenulaceae	<i>Pyrenula</i>	<i>nitida</i>			(Weig.) Ach.	Ges. Naturf. Freunde Berlin Mon. Neuesten	DI War

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							Entleick. Gesamnten Naturk. 6:21 (1814)	
735	Lecanoraceae	<i>Pyrrhospora</i>	<i>bullata</i>			Kalb & Elix	Lich. Neotrop. 13: [570] (2001)	
735	Lecanoraceae	<i>Pyrrhospora</i>	<i>laeta</i>		<i>Lecidea laeta</i>	(Sirt.) Hafellner	Herzogia 9: 86 (1992)	Esp Aw Jf Mal
764	Physciaceae	<i>Pyxine</i>	<i>australensis</i>			Kalb	Herzogia 10: 61 (1994)	Vb Ck
764	Physciaceae	<i>Pyxine</i>	<i>coccifera</i>			(Fie) Nyl.	Mém. Soc. Sci. Nat. Cherbourg 5: 108 (1857)	Nk
764	Physciaceae	<i>Pyxine</i>	<i>coccos</i>			(Sw.) Nyl.	Mém. Soc. Sci. Nat. Cherbourg 5: 108 (1857)	Gs Nk Dl
764	Physciaceae	<i>Pyxine</i>	<i>convexior</i>			(Müll. Arg.) Swinscow & Krog	Norw. J. Bot. 22: 52 (1975)	Ovp
764	Physciaceae	<i>Pyxine</i>	<i>desudans</i>			Kalb	Herzogia 10: 62 (1994)	
764	Physciaceae	<i>Pyxine</i>	<i>petricola</i>			Nyl. in J.M. Crombie	J. Bot. 14: 263 (1876)	Gs Vb Car
764	Physciaceae	<i>Pyxine</i>	<i>plumea</i>			Kalb	Herzogia 10: 66 (1994)	unknown
764	Physciaceae	<i>Pyxine</i>	<i>pungens</i>			Zahlbr.	Ann. Cryptog. Exot. 1: 210 (1928)	Ck
764	Physciaceae	<i>Pyxine</i>	<i>subcinerea</i>			Sirt.	Trans. & Proc. New Zealand Inst. 30: 397 (1898)	Gs
764	Physciaceae	<i>Pyxine</i>	<i>subcinerea</i>			Sirt.	Trans. & Proc. New Zealand Inst. 30: 397 (1898)	unknown
716	Cladoniaceae	<i>Ramalea</i>	<i>cochleata</i>			Müll. Arg.	Bull. Herb. Boissier 4, append. 1: 88 (1896)	Gs Aw Jf
771	Ramalinaceae	<i>Ramalina</i>	<i>australensis</i>			Nyl.	Bull. Soc. Linn. Normandie, ser. 2, 4: 120 (1870)	unknown
771	Ramalinaceae	<i>Ramalina</i>	<i>canariensis</i>			J. Steiner	Oesterr. Bot. Z. 54: 355 (1904)	War
771	Ramalinaceae	<i>Ramalina</i>	<i>celastri</i>	subsp. <i>celastri</i>		(Spreng.) Krog & Swinscow	Norweg. J. Bot. 23: 159 (1976)	Car
771	Ramalinaceae	<i>Ramalina</i>	<i>celastri</i>	subsp. <i>ovalis</i>		(Hook. f. & Taylor) G.N. Stevens	Bull. Brit. Mus. (Nat. Hist.) Bot. 16: 184 (1887)	Jf Esp Dl Mal Nk
771	Ramalinaceae	<i>Ramalina</i>	<i>fecunda</i>					Dl
771	Ramalinaceae	<i>Ramalina</i>	<i>fissa</i>			(Müll. Arg.) Vain.	Mem. Herb. Boissier 5: 2 (1900)	Esp
771	Ramalinaceae	<i>Ramalina</i>	<i>glaucescens</i>			Kremp.	Verh. K.K. Zool. Bot. Ges. Wien 30: 333 (1880)	Esp
771	Ramalinaceae	<i>Ramalina</i>	<i>inflata</i>	subsp. <i>australis</i>		G.N. Stevens	Bull. Brit. Mus. (Nat. Hist.), Bot. 16: 191 (1887)	Aw Mal Coo War Jf Gs Esp
771	Ramalinaceae	<i>Ramalina</i>	<i>subfraxinea</i>	var. <i>norsitica</i>		G.N. Stevens	Bull. Brit. Mus. (Nat. Hist.), Bot. 16: 208 (1887)	Dl Ck
771	Ramalinaceae	<i>Ramalina</i>	<i>subfraxinea</i>	var. <i>subfraxinea</i>		Nyl.	Bull. Soc. Linn. Normandie, ser. 2, 4: 139 (1870)	Dl
771	Ramalinaceae	<i>Ramalina</i>	<i>tropica</i>			G.N. Stevens	Bull. Brit. Mus. (Nat. Hist.) Bot. 16: 210 (1887)	unknown
735	Lecanoraceae	<i>Ramboldia</i>	<i>crassithallina</i>			Kalb	Biblioth. Lichenol. 78: 160 (2001)	
735	Lecanoraceae	<i>Ramboldia</i>	<i>pelraoides</i>		<i>Protoparmelia pelraeoides</i>	(Nyl. ex C. Bab. & Mitt.) Kantvilas & Elix	Bryologist 97: 298 (1994)	Esp
735	Lecanoraceae	<i>Ramboldia</i>	<i>sorediata</i>			Kalb	Biblioth. Lichenol. 78: 161 (2001)	
735	Lecanoraceae	<i>Ramboldia</i>	<i>stuartii</i>			(Hampe) Kantvilas & Elix	Bryologist 97: 299 (1994)	Jf
757	Parmeliaceae	<i>Relictopsis</i>	<i>athergensis</i>			(Vain.) Elix & Verdon	Mycotaxon 27: 282 (1986)	Nk
772	Rhizocarpaceae	<i>Rhizocarpon</i>	<i>geographicum</i>			(L.) DC. in J.B. Lamarck & A.P. de Candolle	Fl. Franc. 3rd edn. 2: 365 (1805)	unknown
772	Rhizocarpaceae	<i>Rhizocarpon</i>	<i>obscuratum</i>			(Ach.) A. Massal.	Ric. Auton. Lich. Crost.: 103 (1852)	Esp

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772	Rhizocarpaceae	Rhizocarpon	polycarpum			(Hepp) Th. Fr.	Lichenogr. Scand. 1: 617 (1874)	Swa Esp Jf
772	Rhizocarpaceae	Rhizocarpon	linel			(Tornab.) Runemark	Opera Bot. 2: 118 (1956)	Esp Coo
757	Parmeliaceae	Rimelia	cefrata			(Ach.) Hale & A. Fletcher	Bryologist 93: 26 (1990)	
757	Parmeliaceae	Rimelia	pustulata			Eliz & Bawingan in Eliz et al.		
757	Parmeliaceae	Rimelia	reticulata			(Taylor) Hale & A. Fletcher	Bryologist 93: 28 (1990)	Esp War Wa Jf Swa
808	Agryciaceae	Rimularia	australis			Hertel & Rambold	Biblioth. Lichenol. 38: 163 (1990)	
764	Physciaceae	Rinodina	asperata			(Shirley) Kantvilas	Pap. Proc. R. Soc. Tasmania 122: 65 (1988)	Swa Jf
764	Physciaceae	Rinodina	australensis			Müll. Arg.	Hedwigia 32: 123 (1893)	Esp
764	Physciaceae	Rinodina	bischoffii			(Hepp) A. Massal.	Framm. Lichenogr.: 26 (1855)	Swa
764	Physciaceae	Rinodina	contradii			Körb.	Syst. Lich. Germ.: 123 (1855)	War Jf
764	Physciaceae	Rinodina	gemarii			Bagl.	Comment. Soc. Crittog. Ital. 1: 17 (1861)	Swa
764	Physciaceae	Rinodina	thiomela			(Nyl.) Müll. Arg.	Flora 64: 515 (1881)	Aw Esp
764	Physciaceae	Rinodina	xanthomelana			Müll. Arg.	Nuovo Giom. Bot. Ital. 23: 390 (1891)	Vb
764	Physciaceae	Rinodrinella	halophila			(Müll. Arg.) H. Mayrhofer	J. Hattori Bot. Lab. 55: 480 (1984)	unknown
774	Roccellaceae	Roccella	montagnei			Bél.	Voy. Ind. Orient. 2: 117 (1834)	Di Vb
797	Acarosporaceae	Sarcogyne	clavus			(DC.) Kremp.	Denkschr. Königl.-Baier. Bot. Ges. Regensburg 4: 212 (1861)	Esp
797	Acarosporaceae	Sarcogyne	privigna			A. Massal.	Geneac. Lich.: 10 (1854)	unknown
797	Acarosporaceae	Sarcogyne	regularis			Körb.	Syst. Lich. Germ.: 267 (1855)	Mur Yal
777	Schaereriaceae	Schaereria	fuscocinerea			(Nyl.) Clauzade & Cl. Roux	Bull. Soc. Bot. Centre-Ouest n.s. Numéro Spécial 7: 829 (1985)	Esp
806	Siphulaceae	Siphula	coriacea			Taylor ex Nyl.	Syn. Meth. Lich. 1: 263 (1860)	Coo Jf Mal Esp Aw War Gs Mur Swa
711	Catillariaceae	Solenopsisora	vulturensis			A. Massal.	Lotos 6: 75 (1856)	unknown
781	Sphinctrinaceae	Sphinctrina	leucopoda			Nyl.	Syn. Meth. Lich. 1: 144 (1860)	unknown
718	Coccocarpiaceae	Spilonema	paradoxum			Bornet	Mém. Soc. Sci. Nat. Cherbourg 4: 226 (1856)	unknown
783	Stereocaulaceae	Stereocaulon	confertatum			Nyl.	Flora 41: 117 (1859)	Esp Jf
786	Teloschistaceae	Teloschistes	chrysophthalmus			(L.) Th. Fr.	Gen. Heterolich. Eur. Recog.: 51 (1861)	Swa War Jf Coo Esp Yal Gs Aw Mal Mur Nul
786	Teloschistaceae	Teloschistes	siberianus			(Laurer) Hilmann	Hedwigia 69: 315 (1930)	unknown
735	Lecanoraceae	Tephromela	araliensis			Rambold	Biblioth. Lichenol. 34: 145 (1089)	Ck Ovp Vb
735	Lecanoraceae	Tephromela	atra		Lecanora atra Kalb	(Huds.) Hafelner in K.	Lich. Neotrop. Exsicc.: 8, 15: 297 (1983)	Jf War Esp Swa
803	Thelotremales	Thelotrema	lepadinum			(Ach.) Ach.	Methodus: 132 (1803)	War Jf
716	Cladoniaceae	Thysanopneumum	hookeri			Mont. & Berk.	Hooker's J. Bot. Kew Gard. Misc. 5: 257 (1846)	Jf Aw Esp Gs War Swa
716	Cladoniaceae	Thysanopneumum	scutellatum			(Fr.) D.J. Galloway	Nova Hedwigia 36: 393 (1982)	Swa Jf War Esp Aw

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736	Lecideaceae	Toninia	australensis		see <i>Trapelopsis colensoi</i>	(Müll. Arg.) Zahlbr.	Cat. Lich. Univ. 4: 262 (1926)	unknown
736	Lecideaceae	Toninia	australis			Timdal.	Opera Bot. 110: 45 ('1991') [1992]	
736	Lecideaceae	Toninia	caeruleonigricans		see <i>Toninia sedifolia</i>	(Lightf.) Th. Fr.	Lichenogr. Scand. 2: 336 (1874)	Mal
736	Lecideaceae	Toninia	glaucoarapa			Timdal.	Opera Bot. 110: 63 ('1991') [1992]	War
736	Lecideaceae	Toninia	sedifolia			(Scop.) Timdal.	Opera Bot. 110: 93 (1991) [1992]	
808	Agryiaceae	Trapelia	coarctata			(Sm.) M. Choisy in R.G. Werner	Bull. Soc. Sci. Nat. Maroc. 12: 160 (1932)	Aw Vb
808	Agryiaceae	Trapelia	mooreana			(Carroll) P. James in H. Hertel	Herzogia 3: 405 (1975)	unknown
808	Agryiaceae	Trapelopsis	colensoi		<i>Toninia australiensis</i>	(C. Bab.) Goth. Schneid.	Biblioth. Lichenol. 13: 146 (1979)	
808	Agryiaceae	Trapelopsis	psammophila			specimen		Gs
810	Tremolechiaceae	Tremolechia	atrata			(Ach.) Hertel.	Khumbu Himal 6: 351 (1977)	
792	Trypetheliaceae	Trypethelium	eluteriae			Spreng.	Anleit. Kennin. Gew. 3: 351 (1804)	DI
810	Umbilicariaceae	Umbilicaria	polyphylla			(L.) Baumg.	Fl. Lips.: 571 (1790)	
794	Usneaceae	Usnea	arida		see <i>Usnea rubrotrincta</i>	specimen		
794	Usneaceae	Usnea	confusa			Asah.	Lich. Jap. 3: 97 (1956)	Jf War
794	Usneaceae	Usnea	dasaea		see <i>Usnea undulata</i>	Slirt.	Scott. Naturalist (Perth) 6: 106 (1881)	
794	Usneaceae	Usnea	inermis			Molyka	Usnea 1: 109 (1936)	Mal War Jf Swa Nul Aw
794	Usneaceae	Usnea	maculata			Slirt.	Scott. Naturalist (Perth) 6: 293 (1881-1882)	unknown
794	Usneaceae	Usnea	nidulifera			Molyka	Usnea 2: 551 (1937)	Jf War
794	Usneaceae	Usnea	pulvinata			Fr. in J.G.C. Lehmann	Pl. Preiss. 2: 145 (1846)	unknown
794	Usneaceae	Usnea	rubrotrincta		<i>Usnea arida</i>	Slirt.	Scott. Naturalist (Perth) 6: 103 (1881)	
794	Usneaceae	Usnea	scabrata	subsp. <i>scabrata</i>		Taylor	Phytologist 1: 1095 (1844)	Mal Gs Jf Aw Esp Coo Yal
794	Usneaceae	Usnea	subalpina			G.N. Stevens	Biblioth. Lichenol. 72: 100 (1999)	Swa
794	Usneaceae	Usnea	subciliata			(Molyka) Swinscow & Krog	Lichenologist 11: 245 (1882)	Jf
794	Usneaceae	Usnea	undulata		<i>Usnea dasaea</i>	Slirt.	Scott. Naturalist (Perth) 7: 75 (1883)	Jf Swa Esp War
795	Verrucariaceae	Verrucaria	balensis			A. Massal.	Ric. Auton. Lich. Crost.: 173 (1852)	unknown
795	Verrucariaceae	Verrucaria	caliciseda			DC. in J.B. Lamarck & A.P. de Candolle	Fl. Franc. 3rd edn. 2: 317 (1805)	Yal
795	Verrucariaceae	Verrucaria	compacta			(A. Massal.) Jatta	Syll. Lich. Ital.: 501 (1900)	Mur
795	Verrucariaceae	Verrucaria	maura			Wahlenb. in E. Acharius	Methodus: 19 (1803)	unknown
795	Verrucariaceae	Verrucaria	microporoides			Nyl.	Bull. Soc. Bot. France 8: 759 (1861)	unknown
795	Verrucariaceae	Verrucaria	subdiscreta			P.M. McCarthy	Muelleria 7: 327 (1991)	unknown
757	Parmeliaceae	Xanthoparmelia	alternata			Elis & J. Johnst. in J.A. Elis et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 188 (1986)	Yal, Gas, Coo
757	Parmeliaceae	Xanthoparmelia	amphixantha			(Müll. Arg.) Hale	Phytologia 28: 486 (1974)	Coo

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757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>amplexula</i>			(Sitr.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.), Bot. 15: 192 (1986)	Coo, Aw, Gs
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>antheriformis</i>			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.), 15: 194 (1986)	Mur
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>areplensis</i>			(Elix & P.M. Armstr.) Filson	Brunonia 7: 205 (1984)	Yal
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>australasica</i>			D.J. Galloway	New Zealand J. Bot. 18: 531 (1981)	War Esp
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>bellatula</i>			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 203 (1986)	Coo
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>burgendorensis</i>			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 205 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>burneiseri</i>			(Elix) Egan	Bryologist 85: 129 (1982)	Gs
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>centralis</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 207 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>cheelii</i>			(Gyeln.) Hale	Phytologia 28: 486 (1974)	Aw
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>concomitans</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 210 (1986)	Aw
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>congensis</i>			(J. Steiner) Hale	Phytologia 28: 486 (1974)	Vb
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>congesta</i>			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 212 (1986)	Esp Coo
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>consociata</i>			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 214 (1986)	Nk
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>constipata</i>			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 223 (1986)	Mal
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>convoluta</i>			(Kremp.) Hale	Phytologia 28: 487 (1974)	Coo
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>convolutella</i>			Elix	Mycotaxon 63: 426 (1997)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>cranfieldii</i>			Elix	Lichenologist 35: 291 (2003)	Mur
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>cravenii</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 223 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>daringensis</i>			Elix & J. Johnst.	Mycotaxon 29: 363 (1987)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>dayana</i>			(Elix & P.M. Armstr.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 225 (1986)	Coo
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>dichotoma</i>			(Müll. Arg.) Hale	Phytologia 28: 487 (1974)	Jf
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>digitiformis</i>			(Elix & P.M. Armstr.) Filson	Brunonia 7: 205 (1984)	Mal
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>dissitifolia</i>			Kurok. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 228 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>donneri</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 231 (1986)	Jf
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>dubitata</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 233 (1986)	Pil

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>eliffi</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 235 (1986)	Mal Aw
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>elevata</i>			Elix	Lichenologist 35: 293 (2003)	Swa
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>elxii</i>			Filson	Brunonia 7: 203 (1984)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>everardensis</i>			(Elix & P.M. Armstr.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 242 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>exillima</i>			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 245 (1986)	AW Gs
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>fiarskyana</i>			(Gyeln.) Hale	Phytologia 28: 487 (1974)	Coo
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>filsonii</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 251 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>flavescens</i>			(Gyeln.) D.J. Galloway	New Zealand J. Bot. 18: 533 (1980)	Aw Jf Mal Gs
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>flindersiana</i>			(Elix & P.M. Armstr.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 253 (1986)	Yal Aw
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>fumigata</i>			(Kurok.) Elix & J. Johnst.	Mycotaxon 29: 371 (1987)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>furcata</i>			(Müll. Arg.) Hale	Phytologia 28: 487 (1974)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>gerhardii</i>			Elix & J. Johnst.	Mycotaxon 33: 355 (1988)	Esp
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>glareosa</i>			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 256 (1986)	Yal Coo Aw
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>globulifera</i>			(Kurok. & Filson) Hale	Mycotaxon 20: 79 (1984)	Ck
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>gongyloides</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 258 (1986)	Mur
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>hybridiza</i>			Elix & J. Johnst.	Mycotaxon 29: 364 (1987)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>hypoleiella</i>		<i>Xanthoparmelia hypoleiella</i>	(Nyl.) Hale	Phytologia 28: 487 (1974)	Jf
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>incerta</i>			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 268 (1986)	Yal Coo War Mal
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>incrustata</i>			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 269 (1986)	Coo Mur
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>isidigera</i>			(Müll. Arg.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 272 (1986)	Mur Gs Jf Esp Aw Coo War Mal Nk
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>isidiosa</i>			(Müll. Arg.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 274 (1986)	Mur
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>kalbariensis</i>			Elix in Elix & Kanvilas	Mycotaxon 73: 445 (1999)	Gs
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>kimberleyensis</i>			Elix	Lichenologist 35: 295 (2003)	Nk
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>lireola</i>			(E.C. Berry) Hale	Phytologia 28: 488 (1974)	Gs Aw Coo Esp
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>louisii</i>			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 279 (1986)	unknown
757	Parmeliaceae	<i>Xanthoparmelia</i>	<i>luminosa</i>			(Elix) Hale	Mycotaxon 20: 79 (1984)	Aw

N ^o	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
757	Parmeliaceae	Xanthoparmelia	melaclystoides			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 284 (1986)	Aw Coo
757	Parmeliaceae	Xanthoparmelia	mexicana			(Gyeln.) Hale	Phytologia 28: 488 (1974)	Aw Esp Ovp
757	Parmeliaceae	Xanthoparmelia	microcephala			Elix & Kantvilas	Mycotaxon 73: 445 (1999)	
757	Parmeliaceae	Xanthoparmelia	molluscula			(Ach.) Hale	Phytologia 28: 488 (1974)	Mal
757	Parmeliaceae	Xanthoparmelia	monadnockensis			Elix	Lichenologist 35: 294 (2003)	Jf
757	Parmeliaceae	Xanthoparmelia	mougoliana			(Nyl.) D.J. Galloway	New Zealand J. Bot. 18: 538 (1981)	Aw Esp Nk Vb
757	Parmeliaceae	Xanthoparmelia	nana			(Kurok.) Elix & J. Johnst.	Mycotaxon 29: 371 (1987)	unknown
757	Parmeliaceae	Xanthoparmelia	nanoidea			Elix	Lichenologist 35: 295 (2003)	Esp
757	Parmeliaceae	Xanthoparmelia	nashii			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 293 (1986)	Coo
757	Parmeliaceae	Xanthoparmelia	neonialis			(Elix & P.M. Armstr.) Elix & T.H. Nash	Mycotaxon 26: 455 (1986)	Coo Aw Mur War
757	Parmeliaceae	Xanthoparmelia	neolincina			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 297 (1986)	Aw Esp Jf
757	Parmeliaceae	Xanthoparmelia	norpraegnans			Elix & J. Johnst.	Mycotaxon 33: 358 (1988)	Gs Aw
757	Parmeliaceae	Xanthoparmelia	norpumila			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 300 (1986)	unknown
757	Parmeliaceae	Xanthoparmelia	norstrigosa			Elix	Mycotaxon 59: 414 (1996)	unknown
757	Parmeliaceae	Xanthoparmelia	norstagata			Elix	Lichenologist 35: 295 (2003)	Jf
757	Parmeliaceae	Xanthoparmelia	notata			(Kurok.) Hale	Phytologia 28: 488 (1974)	Coo Gs Jf Aw
757	Parmeliaceae	Xanthoparmelia	oleosa			(Elix & P.M. Armstr.) Elix & T.H. Nash	Mycotaxon 26: 455 (1986)	unknown
757	Parmeliaceae	Xanthoparmelia	parvocystoides			Elix & J. Johnst.	Mycotaxon 33: 360 (1988)	Jf
757	Parmeliaceae	Xanthoparmelia	parvoincerta			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 300 (1986)	Mur Vb
757	Parmeliaceae	Xanthoparmelia	perfinax			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 306 (1986)	Coo
757	Parmeliaceae	Xanthoparmelia	praegnans			(Elix & P.M. Armstr.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 308 (1986)	Mur Aw Yal Coo Mal
757	Parmeliaceae	Xanthoparmelia	prodromokosii			Hale, Elix & J. Johnst. in J.A. Elix et al.	Mycotaxon 31: 506 (1986)	Coo Mur
757	Parmeliaceae	Xanthoparmelia	pumila			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 312 (1986)	unknown
757	Parmeliaceae	Xanthoparmelia	pustuliza			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 313 (1986)	unknown
757	Parmeliaceae	Xanthoparmelia	romanens			(Elix) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 314 (1986)	unknown
757	Parmeliaceae	Xanthoparmelia	replans			(Kurok.) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 316 (1986)	Mur Aw Mal Gs Coo Yal Esp

N°	Family	Genus	Species	Variety/subspecies	Synonyms	Authority	Literature	IBRA regions
757	Parmeliaceae	Xanthoparmelia	rupestris			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 319 (1986)	unknown
757	Parmeliaceae	Xanthoparmelia	scabrosa			(Taylor) Hale	Phytologia 28: 488 (1974)	Esp Aw Jf Yal Coo
757	Parmeliaceae	Xanthoparmelia	sliei			Elix	Lichenologist 35: 297 (2003)	Gs
757	Parmeliaceae	Xanthoparmelia	subcrustacea			(Gyeln.) Hale	Mycotaxon 20: 79 (1984)	Yal
757	Parmeliaceae	Xanthoparmelia	subdistorta			(Kurok.) Hale	Phytologia 28: 489 (1974)	Mal
757	Parmeliaceae	Xanthoparmelia	subnuda			(Kurok.) Hale	Phytologia 28: 489 (1974)	unknown
757	Parmeliaceae	Xanthoparmelia	substrigosa			(Hale) Hale	Phytologia 28: 489 (1974)	Jf Aw Coo Swa
757	Parmeliaceae	Xanthoparmelia	succedans			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 333 (1986)	Coo
757	Parmeliaceae	Xanthoparmelia	taraclica			(Kremp.) Hale	Phytologia 28: 489 (1974)	Coo Mal
757	Parmeliaceae	Xanthoparmelia	tasmanica			(Hook. f. & Taylor) Hale	Phytologia 28: 489 (1974)	Aw Swa Jf Esp Mal War Coo Gs
757	Parmeliaceae	Xanthoparmelia	tegeta			Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 339 (1986)	Aw Mal Esp
757	Parmeliaceae	Xanthoparmelia	terrestris			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 341 (1986)	Coo
757	Parmeliaceae	Xanthoparmelia	toolbrunupensis			Elix	Lichenologist 35: 298 (2003)	Esp
757	Parmeliaceae	Xanthoparmelia	versicolor			(Müll. Arg.) Hale	Phytologia 28: 490 (1974)	Mur Coo Yal
757	Parmeliaceae	Xanthoparmelia	victoriana			Elix & J. Johnst.	Mycotaxon 29: 367 (1987)	Esp, Jf
757	Parmeliaceae	Xanthoparmelia	weberiella		Xanthoparmelia weberi	(Hale) Hale	Phytologia 28: 490 (1974)	Coo
757	Parmeliaceae	Xanthoparmelia	willisii			(Kurok. & Filson) Elix & J. Johnst. in J.A. Elix et al.	Bull. Brit. Mus. (Nat. Hist.) Bot. 15: 355 (1986)	Mal Nul Yal Mur
757	Parmeliaceae	Xanthoparmelia	xanthofarinosa			Elix	Mycotaxon 47: 127 (1993)	unknown
757	Parmeliaceae	Xanthoparmelia	xanthomelaena			(Müll. Arg.) Hale	Mycotaxon 30: 334 (1986)	Esp
757	Parmeliaceae	Xanthoparmelia	xanthomelanoides			Elix & J. Johnst.	Mycotaxon 33: 363 (1988)	Esp
757	Parmeliaceae	Xanthoparmelia	yowaensis			Elix & J. Johnst.	Mycotaxon 29: 369 (1987)	Gs
786	Teloschistaceae	Xanthoria	ligulata			(Körb.) P. James in D.J. Galloway	New Zealand J. Bot. 21: 198 (1983)	Coo Gs Swa Aw Car Esp War Yal Nul Mur
786	Teloschistaceae	Xanthoria	parolina			(L.) Beltr.	Lich. Bassan.: 102 (1858)	Esp Coo Jf Aw Swa Car Gs Mal

Appendix 2. Abbreviations of authors of lichen species, subspecies and varieties in the checklist. Abbreviation were derived from Brummitt & Powell (1992).

Authority	Authors	Date	Authority	Authors	Date
Ach.	Acharius, Erik	1757-1819	Follmann	Follmann, Gerhard	1930-
Ahti	Ahti, Teuvo Tapio	1934-	Fr.	Fries, Elias Magnus	1794-1878
Anzi	Anzi, Martino	1812-1883	Th. Fr.	Fries, Theodor (Thore) Magnus	1832-1913
A.W. Archer	Archer, Alan W.	1930-	Fümr.	Fümrrohr, August Emanuel	1804-1861
P.M. Armstr.	Armstrong, P.M.	fl. 1983	D.J. Galloway	Galloway, David L.	1968-
Arnold	Arnold, Ferdinand Christian Gustav	1829-1901	Gams	Gams, Helmut	1893-1976
Asahina	Asahina, Yasuhiko (Jasuhiko)	1881-1975	Gaudich.	Gaudichaud-Beaupré, Charles	1789-1854
G. Awasthi	Awasthi, Garima	fl. 1984	Gray	Gray, Samuel Frederick	1766-1828
C. Bab.	Babington, Churchill	1821-1889	Gyeln.	Gyelnik, Vilmos Köfaragó	1906-1945
Bagl.	Baglietto, Francesco	1826-1916	Hafellner	Hafellner, Joseph (Josef)	1951-
F.M. Bailey	Bailey, Frederick Manson	1827-1915	Hale	Hale, Mason Ellsworth	1928-1990
J.K. Bartlett	Bartlett, John Kenneth	1945-1986	Hampe	Hampe, Georg Ernst Ludwig	1795-1880
Baumg.	Baumgarten, Johann Christian Gottlob	1765-1843	Harm.	Harmand, Julien Herbert Auguste Jules	1844-1915
Beck	Beck, Günther von Mannagetta und Lärchenau	1856-1931	R.C. Harris	Harris, Richard C.	1939-
Bél.	Belanger, Charles Paulus	1805-1881	D. Hawksw.	Hawksworth, David Leslie	1946-
Bell.	Bell, S.	fl. 1852	Hazsl.	Hazlinsky, von Hazslin, Friedrich August (Frigyes Ágost)	1818-1896
Bellem	Bellemère, A.	fl. 1960	Hedw.	Hedwig, Johann	1772-1806
Beltr.	Beltramini de Casati, Francesco	1828-1903	Henssen	Henssen, Aino	1925-
Berk.	Berkeley, Miles Joseph	1803-1889	Hepp	Hepp, Johann Adam Philipp	1797-1867
E.C. Berry	Berry, Edward Cain	1898-	Hertel	Hertel, Hannes	1939-
Berthel.	Berthelot, Sabin	1794-1880	Hillmann	Hillmann, Johannes	1881-1943
Bitter	Bitter, Friedrich August Georg	1873-1927	Hoffm.	Hoffmann, George Franz	1761-1826
Bornet	Bornet, Jean-Baptiste Édouard	1828-1911	Hook f.	Hooker, Joseph Dalton	1817-1911
Borrer	Borrill, Martin	1924-	Huds.	Hudson, William	1730-1793
Bosch	Boschma, Hilbrand	1893-1976	Hue	Hue, Auguste-Marie	1840-1917
Breuss	Breuss, Othmar	fl. 1987	Humb.	Humboldt, Friedrich Wilhelm Heinrich Alexander von	1769-1859
Brodo	Brodo, Irwin Murray	1935-	Imshaug	Imshaug, Henry Andrew	1925-
Büdel	Büdel, B.	fl. 1986	Inoue	Inoue, Hiroshi	1932-1989
DC.	Candolle, Augustin Pyramus de	1778-1841	P. James	James, Peter Wilfred	1930-
Carrol	Carrol, Isaac	1828-1880	Jatta	Jatta, Antonio	1852-1912
M. Choisy	Choisy, Maurice Gustave Benoit	1897-1966	J. Johnst.	Johnston, Jen	1954-
Clauzade	Clauzade, F.J. Georges A.	1914-	M. Jörg.	Jørgensen, Per Magnus	1944-
Cleland	Cleland, John Burton	1878-1971	Kalb	Kalb, Klaus	1942-
Clem.	Clements, Mark Alwin	1949-	Kantvilas	Kantvilas, Ginteras	1956-
Cohn	Cohn, Ferdinand Julius	1828-1898	Kashiw.	Kashiwadani, Hiroyuki	1944-
Coppins	Coppins, Brian John	1949-	Keissl.	Keissler, Karl (Carl) von	1872-1965
Cromb.	Crombie, James Mascal Morrison	1830-1906	C. Knight	Knight, Charles	1818-1895
Davies	Davies, Hugh	1739-1821	Korb	Korb, E.	1873-
de Lesd.	de Lesdain, Maurice Bouly	1869-1965	Kremp.	Krempelhuber, August von	1813-1882
Delise	Delise, Dominique Francois	1780-1841	Krog	Krog, Hildur	1922-
Dicks.	Dickson, James (Jacobus)	1738-1822	Kurok.	Kurokawa, Syo	1926-
C.W. Dodge	Dodge, Carroll William	1895-1988	Labill.	Labillardiere, Jacques Julien Houtton de	1755-1834
Du Rietz	Du Rietz, Gustaf Einar	1895-1967	Lam.	Lamarck, Jean Baptiste Antoine Pierre de Monnet de	1744-1829
Duby	Duby, Jean Étienne	1798-1885	Lamy	Lamy, de la Chapelle, Pierre Marie Édouard	1804-1886
Dufour	Dufour, Jean-Marie Léon	1780-1865	J.R. Laundon	Laundon, Jack Rodney	1934-
Egan	Egan, Robert Shaw	1945-	Le Prévost	Le Prévost, Auguste	1787-1860
Ehrh.	Ehrhart, Jakob Friedrich	1742-1795	Leight.	Leighton, William Allport	1805-1889
Eliix	Eliix, John Alan	1941-	Lettau	Lettau, Georg	1878-1951
Engl.	Engler, Heinrich Gustav Adolf	1844-1930	Leuckert	Leuckert, Christian	1930-
Erichsen	Erichsen, Christian Friedo Eckhard	1867-1945	Lib.	Libert, Marie-Anne	1782-1865
Essl.	Esslinger, Theodore Lee	1944-	Lightf.	Lightfoot, John	1735-1788
Fée	Fée, Antoine Laurent Apollinaire	1789-1874			
Filson	Filson, Rex Bertram	1930-			
Flagey	Flagey, Camille	1837-1898			
A. Fletcher	Fletcher, Anthony	1944-			
Flörke	Flörke, Heinrich Gustav	1764-1835			
Flot.	Flotow, Julius Christian Gottlieb Ulrich Gustav Georg Adam Ernst Adam Friedrich von	1788-18			

Authority	Authors	Date	Authority	Authors	Date
Link	Link, Johann Heinrich Friedrich	1767-1851	Schrad.	Schrader, Heinrich Adolph	1767-1836
L.	Linnaeus, Carl von	1741-1783	Screb.	Schreber, Johann-Christian Daniel von	1739-1810
Lumbsch	Lumbsch, Helge Thorsten	1964-	Sheard	Sheard, John Wilson	1940-
H. Magn.	Magnusson, Adolf Hugo	1885-1964	Sipman	Sipman, Henricus Johannes Maria	1945-
Malme	Malme, Gustaf Oskar Andersson (né Andersson, G.O.)	1864-1937	Sm.	Smith, James Edward	1759-1828
W. Martin	Martin, William	1886-1975	Sommerf.	Sommerstorff, Hermann	1889-1913
A. Massal	Massalongo, Abramo Bartolommeo	1824-1860	Spreng.	Sprengel, Curt (Kurt, Curtius) Polycarp Joachim	1766-1833
Matzer	Matzer, Mario	fl. 1990	B.A. Stein	Stein, B.A.	fl. 1988
H. Mayrhofer	Mayrhofer, Helmut	1953-	J. Steiner	Steiner, Julius	1844-1918
P.M. McCarthy	McCarthy, Patrick Martin	1955-	G.N. Stevens	Stevens, Gweneth Nell	1934-
S.L.F. Mey.	Meyer, Susan Lynn Fricke	fl. 1943	Stirt.	Stirton, James	1833-1917
Mig.	Migula, Emil Friedrich August Walther	1863-1938	Stizenb.	Stizenberger, Ernst	1827-1895
Minks	Minks, Arthur	1846-1908	Sw.	Swartz, Olof (Peter)	1760-1818
Mitt.	Mitten, William	1819-1906	Swinscow	Swinscow, Thomas Douglas Victor	1917-
Moberg	Moberg, J. Roland	1939-	Taylor	Taylor, Thomas	1775-1848
Mont.	Montagne, Jean Pierre Francois Camille	1784-1866	J.W. Thompson	Thompson, John William	1890-
Moore	Moore, David	1808-1879	Tibell	Tibell, Leif	1944-
Motyka	Motyka, Józef	1900-	Timdal	Timdal, Einar	1957-
Mudd	Mudd, William A.	1830-1879	Tornab.	Tornabene, Francesco	1813-1897
Müll. Arg.	Muller, Argoviensis Johannes (Jean)	1828-1896	Trevis	Trevisan de Saint-Léon, Vittore Benedetto Antonio	1818-1897
Neck.	Necker, Noel Martin Joseph de	1730-1793	Tuck.	Tuckey, James Hingston	1776-1816
Nordin	Nordin, Ingvar	fl. 1964	Turner	Turner, Dawson	1775-1858
Nuno	Nuno, Mariko	1932-	Vain	Vainio, Edvard (Edward) August	1853-1929
Nyl.	Nylander, (Wilhelm) William	1822-1899	Verdon	Verdon, Douglas	1921-2000
Osbeck	Osbeck, Pehr	1723-1805	Versegghy	Versegghy, Klára	fl. 1956
Ozenda	Ozenda, Paul	1920-	Vêzda	Vêzda, Antonín	fl. 1963
Pers.	Persoon, Christiaan Hendrik	1761-1836	Vill.	Villars, Dominique	1745-1814
Poelt	Poelt, Josef	1924-	A.E. Wade	Wade, Arthur Edwin	1895-1989
Prantl	Prantl, Karl Anton Eugen	1849-1893	Wahlenb.	Wahlenberg, Georg (Göran)	1780-1851
Quél.	Quélet, Lucien	1832-1899	Wawra	Wawra, Heinrich	1831-1887
Rabenh.	Rabenhorst, Gottlob (Gottlieb) Ludwig	1806-1881	Webb	Webb, Philip Barker	1793-1854
Rambold	Rambold, Gerhard Walter	1956-	Wedd.	Weddell, Hugh Algernon	1819-1877
Räsänen	Räsänen, Veli Johannes Paavo Bartholomeus	1888-1953	Werner	Werner, Roger-Guy	1901-1977
Rech.	Rechinger, Karl	1867-1952	Wetmore	Wetmore, Clifford	1934-
Riddle	Riddle, Lincoln Ware	1880-1921	Whipple	Whipple, Amiel Weeks	1816-1863
R.W. Rogers	Rogers, Roderick Westgarth	1944-	Willd.	Wildenow, Carl Ludwig von	1765-1812
Cl. Roux	Roux, Claude	1945-	F. Wilson	Wilson, Francis Robert Muter	1832-1903
Runemark	Runemark, Hans	1927-	V. Wirth	Wirth, Volkmar	1943-
Sandst.	Sandstede, (Johann) Heinrich	1859-1951	With.	Withering, William	1741-1799
R. Sant.	Santesson, Rolf	1916-	Wulfen	Wulfen, Franz Xavier von	1728-1805
Schaer.	Schaerer, Ludwig Emanuel (Louis-Emmanuel)	1785-1853	Zahlbr.	Zahlbruckner, Alexander	1860-1938
Scheid.	Scheidegger, C.	fl. 1985	Zwackh	Zwackh-Holzhausen, (Philipp Franz) Wilhelm	1826-1903

Two new species of *Ptilotus* (Amaranthaceae) from Western Australia

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Abstract

Davis, R.W. Two new species of *Ptilotus* (Amaranthaceae) from Western Australia. *Nuytsia* 15(2) 221–226 (2004). Two new species of *Ptilotus* (Amaranthaceae) from the central and southern regions of Western Australia are described: *Ptilotus chrysocomus* R.W. Davis, known from one location near the Carnarvon Range in the vicinity of the abandoned Blue Hill Station, Little Sandy Desert; and *Ptilotus halophilus* R.W. Davis, known from the margins of Lake Altham and from Lake Hurlstone Reserve in the Lake Grace to Pingrup and Holt Rock to Hyden areas.

Introduction

Ptilotus R.Br. (Amaranthaceae) is a large genus of about 100 taxa (Townsend, 1993) of shrubs, perennial herbs and annuals. The genus is largely endemic to temperate and tropical Australia. It has been nearly a decade since a new species of *Ptilotus* has been described. Gerhard Benl carried out a long-term study of the genus from 1956 to 1994 including a key to species (Benl 1971). He described numerous new species, the last of which was in Benl (1994), and culminated in a draft treatment for the 'Flora of Australia' (Benl unpubl.). During the authors recent development of an electronic key to Australian *Ptilotus* species using DELTA (DEscription Language for TAXonomy; Dallwitz *et al.*, 1993), possibly five new species were discovered, two of which are described here.

Taxonomy

Ptilotus chrysocomus* R.W. Davis, *sp. nov.

Frutex glaber ad 0.5 m altus. Folia opposita vel in brachyblastis fasciculata, decurrentes, anguste oblanceolata, 4–10 mm longa, 0.8–1.2 mm lata. Spicae ovoideae vel globulares, 5–11 mm longae, 7–10 mm latae, flavae, aureae ad cremeae vel in alabastro roseae. Bractae ovatae, 1.2–1.5 mm longae, stramineae, modice pilosae sed ad basim dense pilosae. Bracteolae late ovatae vel orbiculares, 2–2.3 mm longae, stramineae, ad apicem pilosae, versus basim glabrae; pili septati, aurei. Tepala exteriora concava, 3.4–4 mm longa, apice integro, rotundato, cucullato. Tepala interiora tepalis exteriora paulo longiora, leviter cucullata, 3.6–4.2 mm longa, macula brunnea supra paginam anteriorem. Stamina 5, ad apicem tepalorum extensa. Ovarium obiculare vel ovatum, 1–1.2 mm longum, compressum, glabrum, stylo ad centro vel ad fer centro inserto, versus basim dilatato ad apicem tepalorum extenso.

Typus: 4 km ENE of Blue Hill Station (abandoned), south of Carnarvon Range, Little Sandy Desert, Western Australia, 28 August 1999, D.J. Edinger Nats 66 (*holo*: PERTH 05442532; *iso*: CANB).

Compact *shrub* to 0.5 m high, with erect glabrous stems. *Leaves* glabrous, opposite, decurrent, simple, sessile, narrowly oblanceolate, fasciculate at dwarf stem shoots, 4–10 mm long, 0.8–1.2 mm wide, incurved towards branches. *Spikes* sometimes solitary, commonly in a close panicle, ovoid to globular, 5–11 mm long, 7–10 mm wide, yellow to straw coloured, pink tinged in early bud. *Bracts* ovate, 1.2–1.5 mm long, straw coloured, densely pilose at base sparsely so towards apex; hairs septate, golden. *Bracteoles* broadly ovate to orbicular, 2–2.3 mm long, straw-coloured, densely pilose at apex glabrous towards base; hairs septate, golden. *Outer tepals* concave, shorter than inner tepals, 3.4–4 mm long, apex entire, rounded, hooded, hairy outside, glabrous inside; hairs septate, stiff, golden. *Inner tepals* slightly longer than outer tepals, slightly hooded, hairy outside, glabrous inside 3.6–4.2 mm. long, central brown marking on outer surface; hairs finer than those on outer tepals, septate, white/gold. *Staminal cup* 0.5–0.8 mm long. *Stamens* 5, equal, extending to tepal apex or just beyond. *Stipe* short, compressed to terete, 0.1–0.2 mm long. *Ovary* orbicular to ovoid in outline, 1–1.2 mm long, laterally compressed, glabrous. *Style* straight, inserted centrally or almost centrally, dilated towards ovary, 1.4–1.7 mm long, sigmoid, extending to tepal apex. (Figure 1).

Distribution and habitat. Known from the one location, Blue Hill Station south of the Carnarvon Range. Observed on the plain below the bases of breakaways; growing in open acacia scrubland. (Figure 2).

Phenology. Flowering recorded in late August.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. *Ptilotus chrysocomus* was found in a remote area of Western Australia and has only been collected once. Although this species appeared to be a woody perennial, on revisiting the collecting site it was not found. The population is 1.5 km south of a proposed conservation park.

Etymology. The epithet is from Greek *chryso* – golden and *comus* – hairs, referring to the tepal indumentum of gold–of gold-coloured hairs.

Notes. Previously known by the phrase name *Ptilotus* sp. Blue Hill (D.J. Edinger Nats 66). *Ptilotus chrysocomus* does not appear to be closely aligned with any species, however, it would most likely fit within the shrubby group of *Ptilotus*. This species differs from most other species by having a combination of hooded tepals, which are hairy throughout the outer surface, and by having inner tepals marginally longer than the outer tepals. *Ptilotus chrysocomus* also has septate hairs rather than verticillate hairs, a hair type similarly found in two other species, *P. wilsonii* and *P. holosericeus*.

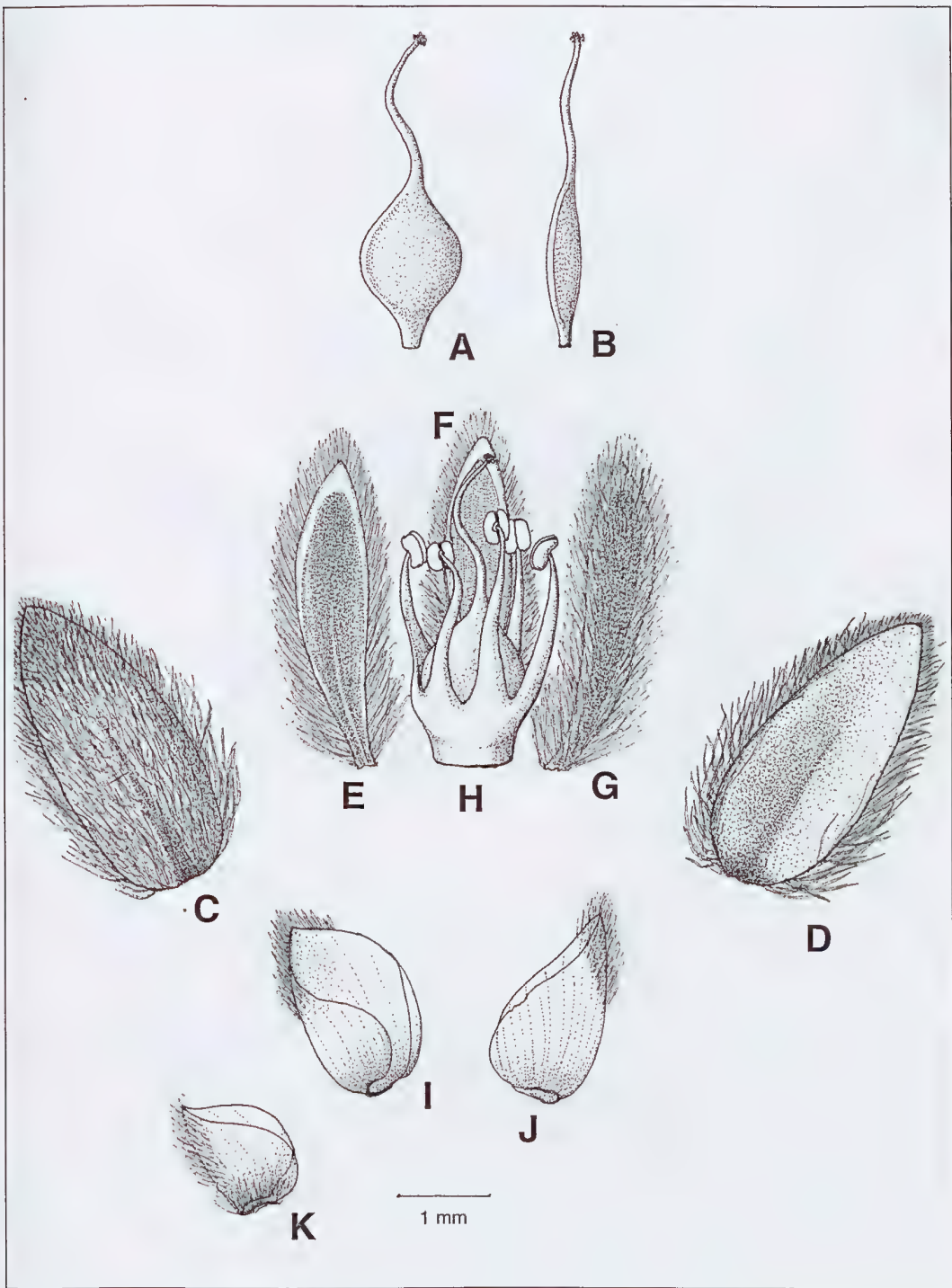


Figure 1. A-K. *Ptilotus chrysocomus* A- ovary front view, B- ovary side view, C- outer view outer tepal, D- inner view outer tepal, E-F inside view inner tepals, G-outer view inner tepal, H- staminal cup encircling ovary of maturing floral parts, I-J-bracteoles, K-bract.

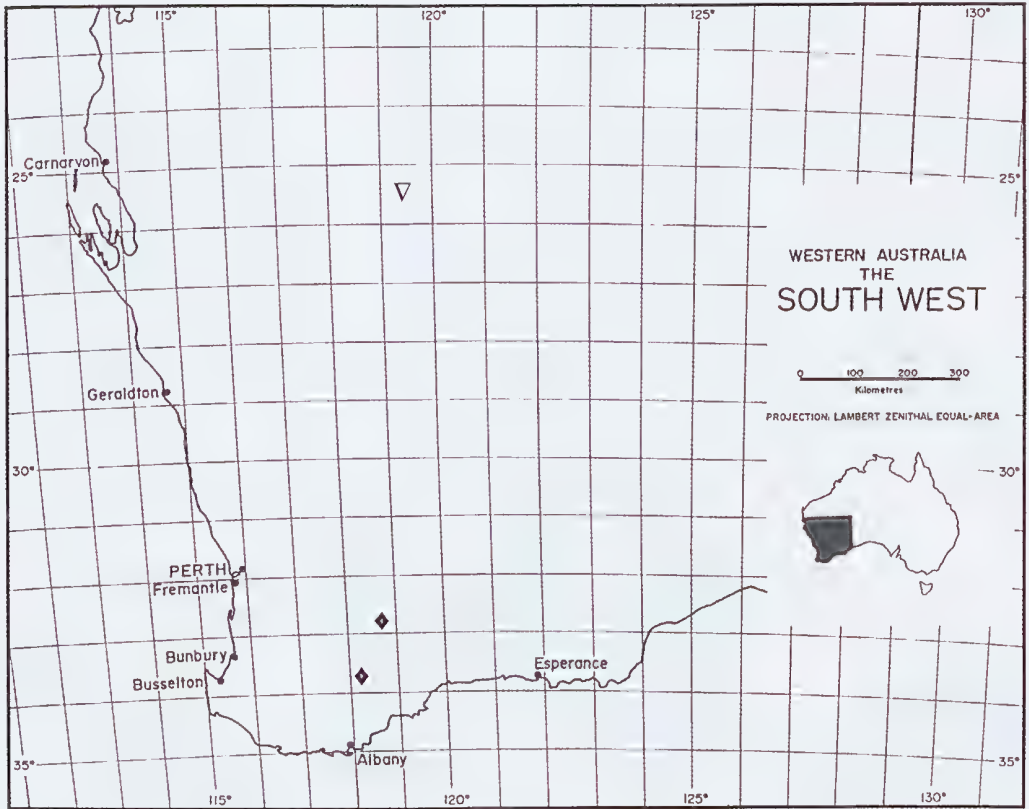


Figure 2. Geographical distributions of *Ptilotus chrysocomus* ▽ and *Ptilotus halophilus* ♦.

***Ptilotus halophilus* R.W. Davis, sp. nov.**

Ptiloto seminudo affinis sed parte inferiore tepalorum pilis verticillatis dense oblecta, ovario orbiculari et stylo brevior differt.

Typus: Lake Altham, southern lake margin, Western Australia, 17 November 1994, M. Graham G 200.28. (*holo*: PERTH 4243463; *iso*: CANB).

Prostrate decumbent perennial herb to 8 cm high, 35 cm wide. *Stems* herbaceous, glabrescent. *Basal leaves* in a rosette, spatulate, *stem leaves* glabrescent, alternate, petiolate, spatulate, obovate or elliptical, mucronate, 8–70 mm long, 2–12 mm wide. *Spikes* solitary, spherical to ovoid, 12–30 mm long, 20–30 mm wide, light green, pink tinged and overall silver sheen. *Bracts* ovate to narrowly ovate, 6.2–7.5 mm long, brown, with sparse verticillate hairs mostly on the central portion, apex acuminate. *Bracteoles* broadly ovate, 5–6 mm long, largely translucent, brown tinged along midrib; apex mucronate, reflexed; hairs verticillate, sparsely confined to midrib. *Outer tepals* linear, 10–14 mm long, concave, margins inwardly folded, apex glabrous, flattened, serrate; hairy outside, glabrous inside; indumentum of verticillate hairs to 8 mm long with shorter secondary verticillate hairs beneath, extending to or just exceeding tepal apex. *Inner tepals* shorter than outer tepals concave, appearing acuminate, 8–12.5 mm long, apex glabrous, centrally folded, flattened, serrate; hairy outside, glabrous inside; hairs verticillate, to 8 mm long with shorter secondary verticillate hairs beneath, extending to or just exceeding tepal apex. *Staminal cup* 1.3–1.5 mm long. *Stamens* 2, reflexing outside the tepals at anthesis, 2–2.2 mm long. *Staminodes* 3, yellow, equal to or just longer than fertile stamens. *Stipe*

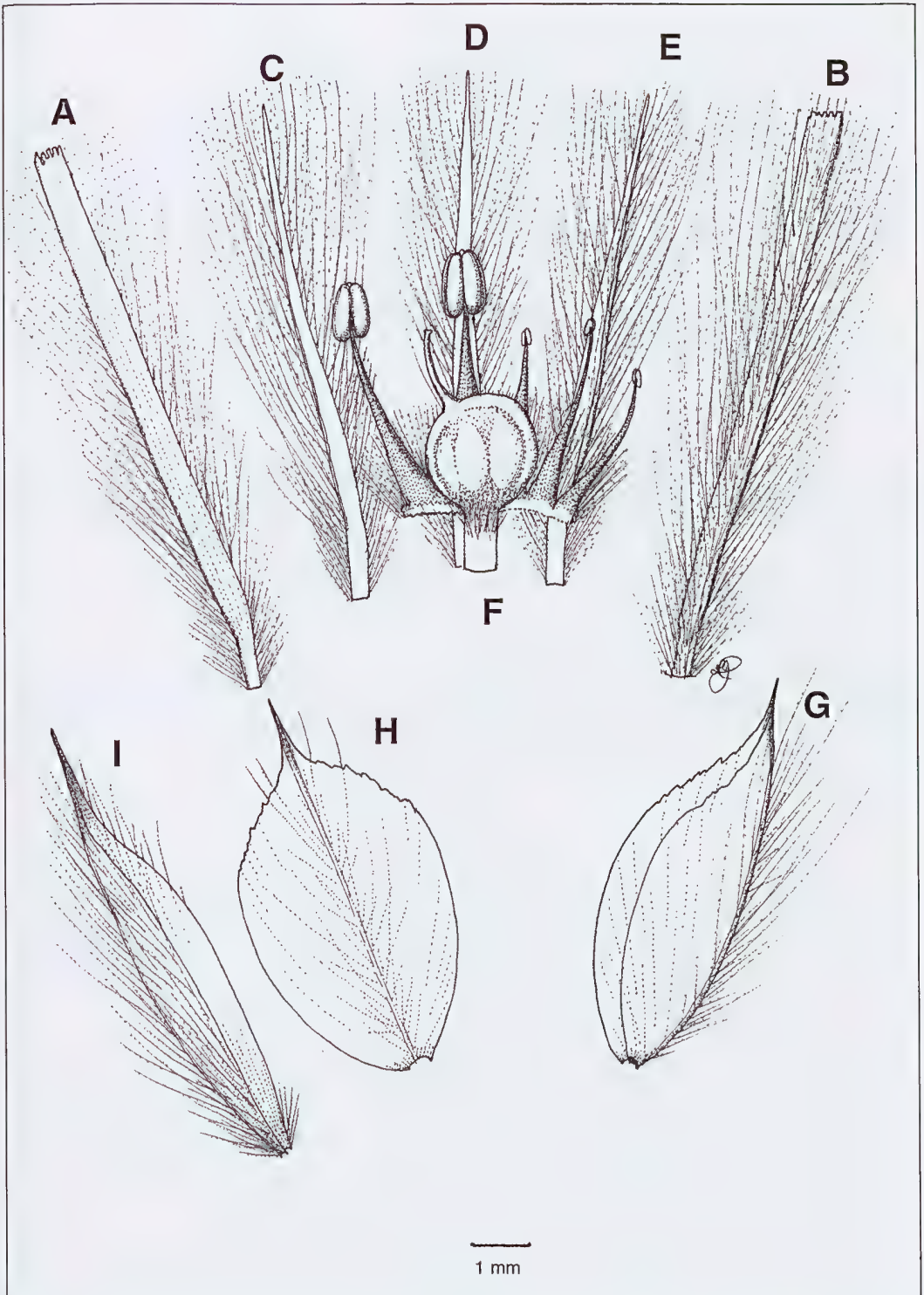


Figure 3. A-J. *Ptilotus halophilus* A-inner view outer tepal, B-outer view outer tepal, C-D inner view inner tepal, E-outer view inner tepal, F-foreground ovary, background staminal cup, stamens and staminodes, G-H bracteoles, I-bract..

compressed to terete 0.8"1 mm long *Ovary* orbicular to ovoid in outline, laterally compressed, 1–1.3 mm long, glabrous or with a few verticillate hairs at summit. *Style* falcate inserted eccentrically, 0.9–1 mm long. *Seeds* brown, ovoid, 1.7–1.8 mm long, minutely rugose. (Figure 3).

Distribution and habitat. There are currently only two collections of *Ptilotus halophilus* at Lake Altham and Lake Hurlstone in the Roe Botanical District. However, Mike Lyons (pers. comm.) has confirmed that several populations of this species were observed during his survey work for the Salinity Action Plan. These populations have been recorded growing on or near sand dunes along the margins of salt lakes within this region. The species can also be found growing in open mallee woodlands or scrubland on grey sandy soils near salt lakes. (Figure 2).

Other specimen examined. WESTERN AUSTRALIA: Lake Hurlstone reserve, 18 June 1998, E. Bennett & K. Del Fante HS 23.11 (PERTH).

Phenology. Flowering from June through to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Four. Although not immediately threatened, there is potential for this species to be threatened mainly due to it inhabiting areas in close proximity to salt lakes, which may make plants vulnerable to rising water tables.

Etymology. The epithet is from Greek *halophilus*, meaning salt loving, a reference to this species growing near salt-lakes.

Notes. Previously known by the phrase name *Ptilotus* sp. salt lake (M. Graham G 200.28). The first recognised collection of *Ptilotus halophilus* had originally been identified as *P. spathulatus*; however, it can be easily separated from *P. spathulatus* by having white globular spikes. The closest relative to *P. halophilus* is *P. seminudus* from which it differs by having an indumentum of verticillate hairs on the lower portion of the tepals, and by an ovoid ovary and shorter style.

Acknowledgments

Special thanks must go to Barbara Rye, Terry Macfarlane and Paul Wilson for their invaluable taxonomic advice and Latin description, Lorraine Cobb for her botanical drawings and Mike Hislop for his botanical advice. ABRS for making available Benl's unpublished draft key for the 'Flora of Australia' and Terena Lally for her advice and assistance with plant specimens.

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***Eucalyptus virginea* and *E. relicta* (Myrtaceae), two new rare forest trees from south-western Australia allied to *E. lane-poolei*, and a new phantom hybrid**

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Abstract

Hopper, S.D. & Wardell-Johnson, G. *Eucalyptus virginea* and *E. relicta* (Myrtaceae), two new rare forest trees from south-western Australia allied to *E. lane-poolei*, and a new phantom hybrid. *Nuytsia* 15(2): 227–240 (2004). *Eucalyptus virginea* and *E. relicta* are described from Mt Lindesay National Park and from the Whicher Range south-east of Busselton respectively. Both species, together with *E. lane-poolei*, are in the earliest branching clade of *E. ser. Curviptera*, which contains many horticulturally attractive large-flowered mallees from semi-arid and desert regions such as *E. macrocarpa* and *E. youngiana*. The discovery and description of these two rare relictual forest trees so recently highlights the need for ongoing botanical survey of south-western Australia's forests. A phantom hybrid, *Eucalyptus lane-poolei* × *relicta*, is also described for the first time. It occurs close to populations of *E. relicta* in the Whicher Range but 150 km south of the nearest recorded *E. lane-poolei*.

Introduction

Rare species are a feature of the rich endemic flora of south-western Australia (Hopper *et al.* 1990; Brown *et al.* 1998; Coates and Atkins 2001). Over 2000 plant taxa are currently considered rare and poorly known with 357 listed as threatened (Declared Rare Flora) under the Wildlife Conservation Act (1950-1979) of which nearly a third are considered to be critically endangered (Coates and Atkins 2001).

A large number of these rare species have geographically restricted ranges (Hopper 1992, Cowling *et al.* 1994, Wardell-Johnson and Williams 1996; Gibson *et al.* 2000), and many have naturally fragmented disjunct distributions (Coates 2000, Gibson *et al.* 2000). Although these patterns are characteristic of the entire south-west, they are best expressed where average annual rainfall varies from 300 to 800 mm in the wheatbelt or Transitional Rainfall Zone defined by Hopper (1979, 1992; Lamont *et al.* 1984). However, parts of the forested High Rainfall Zone (800-1500 mm p.a.) such as the Tingle Mosaic and Southern Ironstone Communities on the Swan and Scott Coastal Plains are also noteworthy for their rare species (Wardell-Johnson and Williams 1996, Gibson *et al.* 2000).

It is nevertheless surprising to report here the discovery of two new forest eucalypts, one a substantial tree attaining 22 m in height and up to 1 m diameter at breast height. The presence of such large

undescribed plants in the south-west forests, albeit rare and very localised, emphasizes the need for ongoing biological survey to fully document the biodiversity of the High Rainfall Zone of the south-west (Mckenzie *et al.* 1996).

Because of their economic significance, forest eucalypts in south-western Australia have attracted attention since the earliest days of European scientific exploration. However, the diversity and taxonomic complexity of eucalypts hindered the botanical description of even the main south-western timber species until resident Australian botanists were able to study them in the field. Only Yate (*E. cornuta* Labill.), named in 1800, and jarrah (*Eucalyptus marginata* Donn ex Smith), named in 1802, were described prior to European settlement.

Other common tree species were named some time later, e.g. tuart (*E. gomphocephala* DC.) in 1828, flooded gum (*E. rudis* Endl.) in 1837, marri (*Corymbia calophylla* (R. Br. ex Lindley) K.D. Hill & L.A.S. Johnson) in 1841, bullich (*E. megacarpa* F. Muell.) in 1860, karri (*E. diversicolor* F. Muell.) in 1863, yarri or blackbutt (*E. patens* Benth.) in 1867, and wandoo (*E. wandoo* Blakely) as recently as 1934.

The collection and naming of less common forest species has proceeded sporadically right up to the present day, commencing with red flowering gum (*Corymbia ficifolia* (F. Muell.) K.D. Hill & L.A.S. Johnson in 1860, and continuing through to Brooker and Hopper's (1993) description of the mallee *E. aspersa*.

The two new forest eucalypts described from the south-west in this paper are both extremely rare and were confirmed by us as new species only in 1993. They were recognised earlier in the 1970s as unusual trees needing investigation by two very able field officers of the then Forests Department, Barney White and Len Talbot. The rarity of these eucalypts, and the superficial similarity of one of them to wandoo or bullich, have undoubtedly hindered botanical recognition until now.

Both species are allied to salmonbark wandoo (*E. lane-poolei* Maiden), an uncommon and disjunct small tree known from four areas between Serpentine and Badgingarra National Park (Sampson 1988; Chippendale 1988; Brooker and Kleinig 2001). *E. lane-poolei* is a taxonomically distinct species of the predominantly Western Australian mallee series *E. ser. Curviptera* Maiden. This series contains some of the most horticulturally desirable mallees among the eucalypts, including mottlecah (*E. macrocarpa* Hook.), with the largest flowers in the genus, the extremely rare but beautiful rose mallee (*E. rhodantha* Blakely & Steedman), and the mysterious Giles' mallee (*E. rameliana* F. Muell.), for years regarded as the only extinct eucalypt until its exciting rediscovery in 1991 in a remote part of the Little Sandy Desert (Sampson *et al.* 1995).

Brooker and Hopper (1993) regarded *E. lane-poolei* to be so distinct from all other members of *E. ser. Curviptera* that they placed it in the monotypic *E. subser. Inflexae* Brooker and Hopper. The species was the only one known at the time in *E. ser. Curviptera* with fully inflexed stamens in the bud, with a radially split surface to the disc of the fruit, and with somewhat glossy and narrowly falcate leaves. Subsequently, Brooker (2000) diagnosed *E. subser. Inflexae* on the basis of having inflexed stamens, seeds compressed-ovoid and not flanged, and ovules in 4 vertical rows.

In their discussion of *E. subser. Inflexae*, Brooker and Hopper (1993: 31) gave the range of *E. lane-poolei* as "from south-east of Busselton and near Denmark, northwards on the western scarp of the Darling Range and adjacent plains extending towards Jurien." The southern locations near Busselton

and Denmark were anomalous populations, only one of which had been inspected in the field (near Busselton), and whose identity required further investigation even though obvious differences in fruit and bud size and habit were known between the southern populations and those of typical *E. lane-poolei* from further north.

We have now completed more detailed field and herbarium studies, and Dr Jane Sampson of the Department of Botany, The University of Western Australia has examined allozyme variation in pertinent populations (Sampson 1988; unpubl.). On the basis of data now available, it is clear that Brooker and Hopper's (1993) southern populations of *E. lane-poolei* near Busselton and Denmark are two distinct species, which we name below *E. virginea* and *E. relictæ*, together with a presumed phantom hybrid – *E. lane-poolei* × *relictæ*.

Eucalyptus virginea Hopper & Wardell-Johnson, *sp. nov.*

A Eucalypto lane-poolei Maiden statura majore (ad 22 m alta), trunco latiore erectiore (ad 1 m dbh), cortice leviter pulvereo, foliis latioribus discoloribus corporibus oleosis numerosioribus, inflorescentiis 7-floribus, alabastris minoribus (ad 7 mm diametro), et fructibus minoribus (ad 12 mm diametro) differt. *A E. relictæ* Hopper & Wardell-Johnson statura majore, habitu arboreo, cortice laevi, foliis tenuioribus discoloribus, inflorescentiis 7-floribus et alabastris late ovoideis vel rhomboideis differt.

Differs from *E. lane-poolei* Maiden in its greater stature to 22 m tall, its thicker more erect trunk to 1 m d.b.h., its paler slightly powdery sometimes scribbly bark, its broader (to 25 mm) discolorous leaves with more abundant oil glands, its 7-flowered inflorescences, its smaller floral buds to 7 mm diameter, and its smaller fruits to 12 mm diameter. Differs from *E. relictæ* Hopper & Wardell-Johnson in its greater stature to 22 m tall and tree habit, its smooth bark, its thinner strongly discolorous leaves, its 7-flowered inflorescences and its broadly ovoid to rhomboid buds.

Typus: Mount Lindesay National Park, NE of Denmark, 34° 50' 54" S 117° 16' 0" E, Western Australia, 2 June 1993, S.D. Hopper 8309 & A.P. Brown (*holo:* PERTH 06870279, PERTH 06870392; *iso:* AD, CANB, MEL, NSW).

Tree to 22 m tall; lignotuberous, with stems up to 1.6 m apart; individual *stems* erect, slightly sinuous, with d.b.h. to 1 m, burls common; wood brittle; *bark* smooth, slightly powdery, thin (to 16 mm thick), white with scattered small patches of old grey-brown persistent, new bark rich yellow to slightly orange, sometimes with scribbles to 5 cm long. *Crown* of thick sinuous spreading branches. *Branchlets* lacking pith glands, usually with dark chocolate-brown adherent old bark over creamy-yellow new bark. *Cotyledons* Y-shaped, to 2 cm long. *Leaves* of the seedling remaining opposite for 7 or 8 pairs, then alternating, linear initially, becoming ovate, to 6 x 3 cm, discolorous, dark green and dull above. *Adult leaves* lanceolate-falcate, to 17 cm x 25 mm, discolorous, dark-green and satin-glossy above, dull and olive green below, oil glands abundant, conspicuous, irregular, intersectional. *Inflorescences* 7-flowered, peduncles terete, to 1.5 cm long. *Buds* pedicellate, broadly ovate to rhomboid, to 11 mm long x 7 mm wide, opercula hemispherical to slightly conical, stamens inflexed, cream. *Fruit* pedicellate, to 6 mm high x 12 mm wide, depressed, cupular, with a flat to slightly ascending broad thick annular rim, valves persistent, prominently ascending to 3–6 mm above rim. (Figure 1).

Specimens examined. WESTERN AUSTRALIA: Denmark River, 34°50'54" S 117°16' 00" E, 28 January 1993, A.R. Annels 3112, 3167 (PERTH 04293908, 03344835); 5.5 km W of Denmark off Lapkos Rd, 34°58'30" S 117°17' 42" E, 8 July 1993, A.R. Annels 3415, 3416, 3417, 3418 (PERTH



Figure 1. *Eucalyptus virginea* at the type location (Wardell-Johnson s.n.): (A) largest tree known, 22m tall and 87 cm d.b.h.; (B) buds and flower; (C) fruits; (D) trunks and bark of a resprouting individual in amongst granite boulders. Photos G. Wardell-Johnson.

04533038, 04533046, 04533062, 04535499); W side of Denmark River, WNW of Mt Lindsey (*sic*), 34°50'36" S 117°16'07" E, 3 September 2000, *M.I.H. Brooker* 13192 (PERTH 05749174, AD, CANB, MEL, NSW, BRI, HO); Denmark River, vicinity of Mt Lindsay (*sic*), 22 November 1960, *B.J. White s.n.* (PERTH 01335596); edge of granite outcrop, midslope, 500 m E of Denmark River, 200m N of Mt Lindesay walk track, 34°50'54" S 117°16'00" E, 27 December 2001, *G. Wardell-Johnson* 12001 (PERTH 05894646).

Distribution and habitat. *E. virginea* is known to occur in two main populations separated by less than a kilometre on the western slopes of Mt Lindesay about 15 km north-west of Denmark. A third population occurs 14 km to the south-west of the main populations and about 5.5 km west of Denmark. The habitat occupied by *E. virginea* is transitional between moist loams in creeklines where karri dominates, drier upland lateritic and clayey soils where marri and jarrah dominate, and shrubland on granite outcrops.

The Mt Lindesay populations occur in the narrow V-shaped valley of the Denmark River and along a small, steeply sloping, narrowly incised, tributary originating on Mt Lindesay. In these areas, the landscape includes considerable outcropping granite. Stands of *E. virginea* do not extend into the gently sloping lateritic terrain beyond. The third population occurs in shallow soils on slight rises in otherwise swampy terrain at the confluence of two gullies. The surrounds of this area include brown and yellow loams occupied by karri forest, and laterite occupied by jarrah/marri forest.

The forest stand structure is notable for occasional large specimens of *E. virginea* with abundant smaller trees of each of *Corymbia calophylla*, *Eucalyptus marginata*, and *E. virginea* (Figure 2). Largest trees tended to be in deep soils between rock outcrops in sheltered sites where they were the dominant eucalypt. *E. virginea* is of small stature where it occurs in pure stands adjacent exposed granite outcrop.

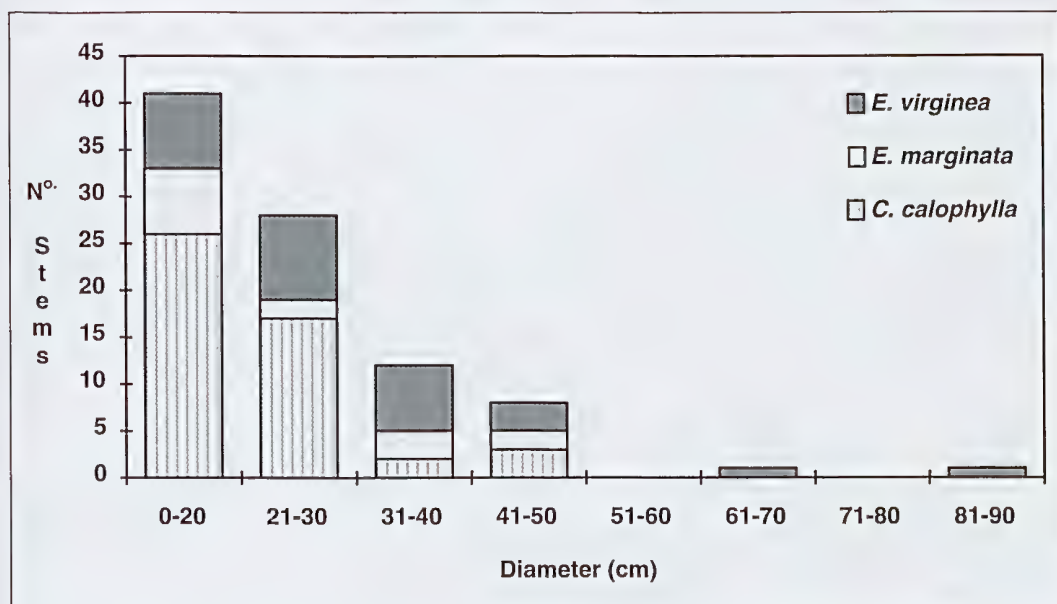


Figure 2. Size class distribution and stand structure of trees occurring in four 20m² quadrats including *Eucalyptus virginea* near Mt Lindesay. The diameter at breast height of all trees > 10 cm DBH was measured.

Understorey species associated with *E. virginea* reflect the transitional nature of the sites occupied by this eucalypt. They include species associated with granite outcrops (e.g. *Agonis marginata*, *Lepidosperma effusum*, *Borya longiscapa*, *Hakea undulata*, *Dodonaea ceratocarpa*, *Daviesia horrida* and *Andersonia sprengelioides*), sands (e.g. *Podocarpus drouynianus*, *Agonis parviceps*, *Agonis hypericifolia*, *Hypocalymna angustifolia* and *Leucopogon australis*), loams (e.g. *Hovea elliptica*, *Xanthosia rotundifolia*, *Leucopogon verticillatus*, *Tetrarrhena laevis* and *Loxocarya flexuosa*) and laterite (e.g. *Hibbertia cunninghamii*, *Lepidosperma angustifolia* and *Bossiaea ornata*).

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Four. The species, although highly geographically restricted, occupies half a square kilometre, and numbers hundreds of individuals most within a national park. However, it has very thin bark and is susceptible to recurrent or intense fire even though it is lignotuberosus (Figure 1) and has epicormic sprouts following low intensity fire. It also occurs low in the landscape profile and would be affected through dam construction. Regular monitoring is therefore recommended.

The two stands on Mt Lindesay are in a secure conservation reserve and both include a wide range of size and age classes including lignotuberosus advanced growth. A lack of seedlings observed two years following the 1991 fire may not be of concern in the medium term as individuals of this species are clearly very long-lived and seedling establishment occasional. Nevertheless this species is relictual in both habitat and distribution, and may be at risk in the longer term without management intervention.

The third population occurs as a remnant in partially cleared agricultural land. This stand now consists of several trees scattered over three hectares. No seedlings, saplings, or lignotuberosus advanced growth of this species is present at this site. This stand is unlikely to have been much larger in historic times, as the surrounds are predominantly karri forest on brown to yellow loams and jarrah/marri forest. Nevertheless the current landholder has taken steps to protect *E. virginea*. As this stand is clearly well separated from the main distribution of the species at Mt Lindesay, it is deserving of the highest priority for conservation.

Of course, if the stand were planted rather than natural, such priority conservation action would be unnecessary. We sought to confirm the origin of the stand by determining the age of a tree. However, *E. virginea* often occurs as individuals with several stems from the same rootstock, preventing the aging of all but individual stems by dendrochronological means. We therefore obtained a sample of the rootstock, both from as near the center of the clump and as near the soil surface as possible from the largest diameter clump (1.6 m) in the stand that could be readily attributed to a common rootstock. This material was aged using carbon dating techniques at the Waikato University radio-carbon laboratory. The sample was analysed using 3 LKB/WALLAC 1220 Quantulus liquid scintillation spectrometers to achieve a high level of both accuracy and precision in dating (Alan Hogg, pers. comm.). The sample was aged at 330 ± 30 years, suggesting that the stand was indeed natural rather than planted.

Flowering period. January. Flowered prolifically in 2002 four years after moderate intensity fire in 1998 but not in the intervening period.

Etymology. The specific epithet refers to the bark (Latin *virgineus*, pure white), and also alludes to the original collector, Barney White, forester, in recognition of his contribution to the conservation and management of the southern forests of Western Australia.

Notes. The discovery and eventual description of such a large forest tree as *E. virginea* so recently is remarkable given the public attention focussed on forest conservation and management over the past few decades. From a distance, *E. virginea* resembles *E. wandoo*, which has its most south-westerly occurrence near Mt Lindesay to the north-east on alluvial loams associated with a small creek crossing on Denbarker Road (Brooker and Hopper 1991). Another population has also been located immediately north of Mt Lindesay (Wardell-Johnson and Williams 1996). However, *E. wandoo* is in the *E. series Levispermae* of *E. sect. Bisectaria*, and a cursory examination of buds, fruits and seeds reveals it is quite unrelated to taxa of *E. ser. Curviptera* to which *E. virginea* belongs.

The first collection of *E. virginea* was made by forester Barney White in November 1960, who submitted it to the Western Australian Herbarium where it was determined as *E. lane-poolei*, possibly by Government Botanist C.A. Gardner. This specimen was recognised as a possibly new taxon allied to *E. lane-poolei* but with smaller fruit when examined by SDH in the early 1990s. Discussion with M.I.H. Brooker and a joint examination of White's specimen at the time led to the view that its status required field investigation, and it was obscurely referred to by including reference to an occurrence of *E. lane-poolei* "near Denmark" in a subsequent paper (Brooker and Hopper 1993).

Independently, while undertaking a comprehensive floristic survey of the southern high rainfall tingle mosaic, GW-J in 1992 came across White's specimen and contacted Barney White for more accurate details of the location. Subsequent field work in January 1993 led to relocation of the species by GW-J and its collection by Technical Officer Tony Annels. Details of the precise location were communicated to SDH in May 1993. On June 2, accompanied by Technical Officer Andrew Brown, SDH investigated the Mt Lindesay site, confirmed that the species was indeed new, and made the type collection. He was also provided with seedlings of *E. virginea* grown by Denmark environmental educator Basil Schur from seed collected off private property on Lapkos Road. For a number of years Mr Schur had been aware of this unusual eucalypt and considered that it might be something new. Subsequently, a joint field inspection of this population occurred, and independent collections were made on July 8 1993 by Tony Annels. Together the present authors resolved to describe the species as new, a view subsequently affirmed by M.I.H. Brooker (pers. comm., 2001) after he had collected the species from the type location in 2000.

Thus, as with many recent exciting novelties named from the south-western flora, the present description of *E. virginea* owes much to a combination of astute observation by able field workers and ecologists, together with historical and botanical knowledge of taxonomists sufficient to confirm that the species was new after examination of relevant herbarium collections, literature, and, most importantly, seeing plants in the field. The delay of four decades between first herbarium collection and final description reflects how long it can take for the above combination of circumstances to occur given the paucity of taxonomists working on the south-western flora, and the remarkable richness of material awaiting description or still undiscovered. Based on present rates of discovery, we are still decades away from a near-complete inventory of this flora, even among trees such as eucalypts (Hopper 2003).

E. virginea is allied to *E. lane-poolei* and to *E. relicta*, all three species which we place in the *E. subseries Inflexae*. Work on allozyme variation in *E. ser. Curviptera* by Jane Sampson (pers. comm.) has affirmed the close relationship of *E. virginea* and *E. lane-poolei*, and suggests that these taxa are sister to the other species in the series found in drier inland country of the wheatbelt and desert. These relationships mirror those found in Western Australian monocalypts (Ladiges *et al.* 1987), where the tingles *E. jacksonii* and *E. brevistylis* confined to high rainfall south-coastal forests are basal to a major

radiation of drier country trees and mallees, as predicted from reviews of the ecological biogeography of the south-west (Hopper 1979, 1992; Hopper *et al.* 1996).

E. virginea differs from *E. lane-poolei* Maiden in its taller stature to 22 m, its thicker more erect trunk, its paler sometimes scribbly bark, its broader discolorous leaves with more abundant oil glands, its 7-flowered inflorescences, and its smaller ovoid to rhomboid floral buds to 7 mm diameter and smaller fruits to 12 mm diameter on shorter peduncles to 1.5 cm long. *E. lane-poolei* is a smaller tree to 10 m tall, with trunks rarely attaining 50 cm d.b.h., its bark salmon-brown weathering to greyish-white and never scribbly, its leaves concolorous, slightly glossy, with relatively fewer oil glands, its inflorescences to 11-flowered, its buds ovoid to globose and to 12 mm diameter, its fruits to 14 mm diameter, and its peduncles to 3 cm long (Brooker and Kleinig 2001). It also grows in massive laterite or clay-loam associated with the Darling and Dandaragan Scarps. *E. lane-poolei* has not been recorded from granite outcrops.

E. virginea differs from *E. relict*a Hopper & Wardell-Johnson in its greater stature to 22 m tall and tree habit, its smooth bark, its thinner strongly discolorous leaves, its 7-flowered inflorescences and its broadly ovoid to rhomboid buds.

The discovery and naming of *E. virginea* reinforces the importance of the Mt Lindesay granite inselberg as a moderate centre of endemism within the tangle mosaic of the highest rainfall south coast forests (Wardell-Johnson and Williams 1996). Some 29 rare or locally endemic taxa occur within 10 km of Mt Lindesay. Strict endemics of the Mt Lindesay inselberg include *Grevillea fuscolutea*, *Laxmannia grandiflora* subsp. *brendae* Keighery ms, *Cryptandra congesta* and *Andersonia hammersleyana* Lemson ms. District local endemics, mainly confined to the Mt Lindesay inselberg but with one or two populations close by, include *Borya longiscapa*, *Andersonia virolens* Lemson ms, *Calothamnus* sp. Mt Lindesay (B.G. Hammersley 439) and *Lasiopetalum cordifolium* subsp. *acuminatum* E.M. Benn. & K. Shepherd ms. The recency of the discovery/description of many of these endemics highlights the view that the granite outcrop flora of south-western Australia deserves ongoing survey and special conservation attention, even in such well travelled and explored regions as the forests of the High Rainfall Zone (Hopper *et al.* 1997).

Mt Lindesay is high enough (459 m a.s.l.) to have remained as an island during early-mid Tertiary marine transgressions of the south coast. Consequently, it provides a classic example of an old south-west terrestrial landform affording insular habitat suitable for the evolution of local endemics over tens of millions of years (Hopper 1979, 1992; Hopper *et al.* 1996). The early branching position of *E. virginea* and allies in the phylogeny of *E. ser. Curviptera* suggests that they are derivatives of a palaeoendemic lineage (*E. subseries Inflexae*) with origins possibly dating back well into the Tertiary. It would be interesting to further test this hypothesis through DNA sequence analysis as has occurred, for example, for the rhamnaceous shrub *Granitites* which is endemic to granite inselbergs in the eastern wheatbelt and adjacent goldfields (Fay *et al.* 2001).

Another question deserving further investigation is why the Mt Lindesay inselberg is so rich in endemics compared to other similarly high inselbergs to the west such as Mt Frankland, Mt Roe, Mt Mitchell and Granite Peak. Neither *E. virginea* nor any other of the Mt Lindesay endemics has been found on these granite eminences, but each has some endemics, varying from peak to peak. Perhaps the smaller areal extent of the western peaks provided insufficient wet habitat during arid periods for mesic palaeoendemics to resist extinction. Elsewhere we explore in greater detail ecological aspects of the

refugial forest habitat occupied by *E. virginea* compared with adjacent habitats not so occupied (Wardell-Johnson and Hopper, *in prep.*)

*Eucalyptus relict*a Hopper & Wardell-Johnson, *sp. nov.*

A *E. virginea* Hopper & Wardell-Johnson et *E. lane-poolei* Maiden statura majore (ad 7 m alta), habitu arboreo vel 'mallee', cortice aspero, et foliis crassioribus tantum leviter discoloribus differt. Insuper ab *E. lane-poolei* Maiden foliis latioribus (ad 30 mm latis) corporibus numerosioribus, alabastris minoribus ad 7 mm diametro, et fructibus minoribus ad 10 mm diametro differt.

Differs from *E. virginea* Hopper & Wardell-Johnson and *E. lane-poolei* Maiden in its smaller stature to 7 m tall and tree-mallee habit, its rough bark, and its thicker only slightly discoloured leaves. Also differs from *E. lane-poolei* Maiden in its broader leaves to 30 mm wide with more abundant oil glands, its smaller floral buds to 7 mm diameter, and its smaller fruits to 10 mm diameter.

Typus: 3.0 km E of Sabina Road, 33° 46' 11" S, 115° 27' 53" E, Western Australia, 21 January 1993, G. Wardell-Johnson 3180 (*holo*: PERTH 02657503).

Tree or tree-mallee to 7m tall; lignotuberosus, individual stems erect, slightly sinuous, with d.b.h. to 0.5 m, wood not brittle, rich mahogany red; *bark* rough all the way to branchlets, thick, grey. *Branchlets* lacking pith glands. *Seedlings* not seen. *Coppice leaves* ovate, acute. *Canopy* yellowish green. *Adult leaves* lanceolate-falcate, to 12 cm x 30 mm, slightly discoloured, dark-olive-green and satin-glossy above, dull and paler green below; oil glands intersectional, not translucent, brownish-faintly opaque. *Inflorescences* to 13-flowered; peduncles terete, to 1.5 cm long. *Buds* pedicellate, rhomboid, to 10 mm long x 7 mm wide, opercula conical, stamens inflexed, cream. *Fruit* pedicellate, to 5 mm high x 10 mm wide, depressed, cupular, with a flat to slightly ascending broad thick annular rim, valves persistent, prominently ascending to 3-4 mm above rim. (Figure 3).

Specimens examined. WESTERN AUSTRALIA: 2.1 km S of Sabina Rd on track, Whicher Range, 33°46'28" S 115°29'06", 3 November 2000, D. Nicolle 3550 & M. French (PERTH 05744296, CANB); Vasse Highway, SE of Busselton, 33°45'18" S 115°31'06", 3 November 2000, D. Nicolle 3551 & M. French (PERTH 05744318, AD, CANB); 2.8 km E of Sabina Road along small track, 33°46'11" S 115°27'50", 21 January 1993, G. Wardell-Johnson 3178 (PERTH 02657473); 3.1 km E of Sabina Road along small track, 33°46'11" S 115°27'55", 21 January 1993, G. Wardell-Johnson 3179 (PERTH 02657481); 3.4 km E of Sabina Road along small track, 33°46'12" S 115°28'00", 21 January 1993, G. Wardell-Johnson 3183 (PERTH 02657546); Corner of Sabina River track and Whicher Rd, 33°46'15" S 115°29'04", 21 January 1993, G. Wardell-Johnson 3184 (PERTH 02657554); Vasse Highway, 40 km from Nannup, 33°45'18" S 115°31'06", 2 January 2002, G. Wardell-Johnson 12002 (PERTH 05894654).

Distribution and habitat. *E. relict*a occurs in two known populations within four kilometres of one another in minor valleys in the Whicher Range about 17 km south-east of Busselton. The known range area and geographic extent of this species is 0.15 km² and 2 km². The topography of the area is generally undulating, with the known populations on upper slopes (100-140 m a.s.l.) close to the highest elevation in the Whicher Range (205 m). Soil is grey clay-loam.

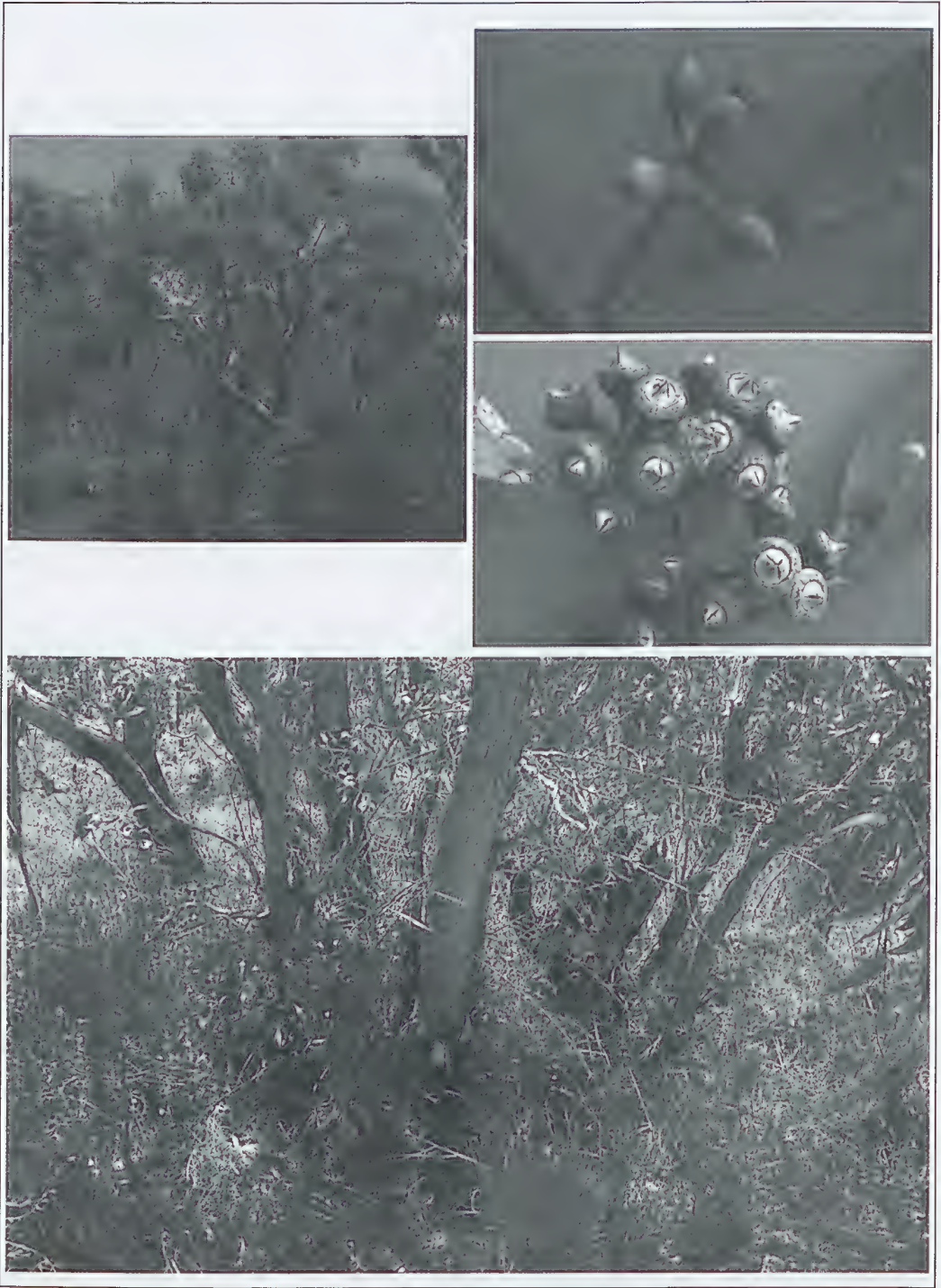


Figure 3. *Eucalyptus relictus* at the type location (Wardell-Johnson s.n.): (A) habit; (B) buds; (C) fruits; (D) trunks and bark of a resprouting individual. Photos G. Wardell-Johnson.

Associated dominant overstorey species include *Corymbia haematoxylon*, *C. calophylla*, *Eucalyptus marginata*, and *Allocasuarina fraseriana*. Common understorey species include *Acacia pulchella*, *A. browniana*, *Grevillea brevicuspis*, *Xanthorrhoea preissii*, *Hypocalymma angustifolium*, *Hakea lissocarpha*, *H. amplexicaulis*, *Dryandra* sp., *Leucopogon australis*, *Calothamnus sanguineus*, *C. pallidus*, *Hibbertia hypericoides*, *Adenanthos barbiger*, and *Kingia australis*.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two. *E. relict*a is highly geographically restricted. One population consists of six individual clumps separated by 20–300 m along a small branch of the Sabina River. The other population comprises less than 100 clumps, and straddles the Vasse Highway, with most clumps extending from the west verge for c. 500 m along the headwaters of a subdued creekline. There may be a third population on the south side of Margaret Road (L. Talbot pers. comm., 1994), but this has not been confirmed in subsequent searches. The known range area, consequently, is 0.15 km² and the geographic extent is 2 km².

The area has been searched thoroughly by vehicle on all accessible tracks as well as by foot traverse over a number of years by L. Talbot and G. Wardell-Johnson. *E. relict*a occurs within the boundaries of a proposed national park. However, its numbers are so low and the placement of the main population on and adjacent to road verges require special management attention, as does the potential impact of dieback disease on the species and/or associated communities.

Flowering period. January – February.

Etymology. The specific epithet refers to the phylogenetic and landscape position of the species. It appears to be a classic wet-country relict comparable to the tingles (*E. guilfoylei*, *E. jacksonii*, *E. brevistylis* – Wardell-Johnson and Coates 1996), being an early branching lineage together with *E. virginea* and *E. lane-poolei* of the *E.* series *Curviptera*.

Notes. *E. relict*a is a remarkable discovery first identified as new by Len Talbot in the 1970s when, as a field officer of the then Forests Department, he was involved in road survey and construction for the Whicher Range (Donnybrook Sunklands) pine plantation project. Although it occurs on a major highway at one location, it has probably been confused with the superficially similar *E. decipiens* subsp. *chalara* or *Corymbia haematoxylon*, both of which have a similar bark and habit.

*E. relict*a is allied to *E. virginea*, from which it differs in its smaller stature (to 7 m tall) and tree-mallee habit, its rough bark, and its thicker only slightly discoloured leaves. It is also related to *E. lane-poolei*, from which it differs in its rougher bark, its broader leaves to 30 mm wide with more abundant oil glands, its smaller more rhomboid floral buds to 7 mm diameter, and its smaller fruits to 10 mm diameter.

***Eucalyptus lane-poolei* × *relict*a**

Straggly small tree or mallee to 3 m tall, thick trunked, bark easily rubbed off, light grey-brown, rough like bloodwoods. Branchlets lacking pith glands. Seedlings not seen. Coppice leaves not seen. Canopy yellowish green. Adult leaves lanceolate-falcate, to 11 cm × 20 mm, slightly discoloured. Inflorescences to 11-flowered; peduncles terete, to 2.0 cm long. Buds pedicellate, ovoid, to 10 × 8 mm, opercula hemispherical, stamens inflexed. Fruit pedicellate, to 5 mm high × 9 mm wide, depressed, cupular, with a flat to slightly ascending broad thick annular rim, valves persistent, prominently ascending to 5 mm above rim. (Figure 4).

Specimens examined. WESTERN AUSTRALIA: SE of Busselton on tributary of Sabina River, 33°46'S 115°28' E, 6 November 1987, *M.I.H. Brooker* 9805 (PERTH 01396293, CANB); Whicher Block 5.5 km SE of Yoongarillup on Sabina River, 33°45' S 115°27' E, 6 November 1987, *S. D. Hopper* 6316 (PERTH 01101315).

Distribution and habitat. The only known stand of this hybrid, from which the above two specimens were collected, consists of a single clump 8–10 m across along a major tributary of the Sabina River at an elevation of 90 m a.s.l. Soil is grey clay-loam.

Associated dominant overstorey species include *Corymbia haematoxylon*, *C. calophylla*, and *Eucalyptus marginata*. Common understorey species include *Acacia myrtifolia*, *Grevillea quercifolia*, *G. manglesioides*, *Hibbertia quadricolor*, *Melaleuca thymoides*, *Persoonia longifolia*, *Gastrolobium polymorphum* and *Petrophile serruieae*.

Conservation status. This is an extremely rare taxon known only from one clump and would normally be recommended as critically endangered and warranting declaration as Rare Flora. However, because it is a hybrid, and we have yet to obtain viable seed from it, further research on its ability to reproduce is needed for it to qualify for consideration for special protection.

Flowering period. Probably January – February.

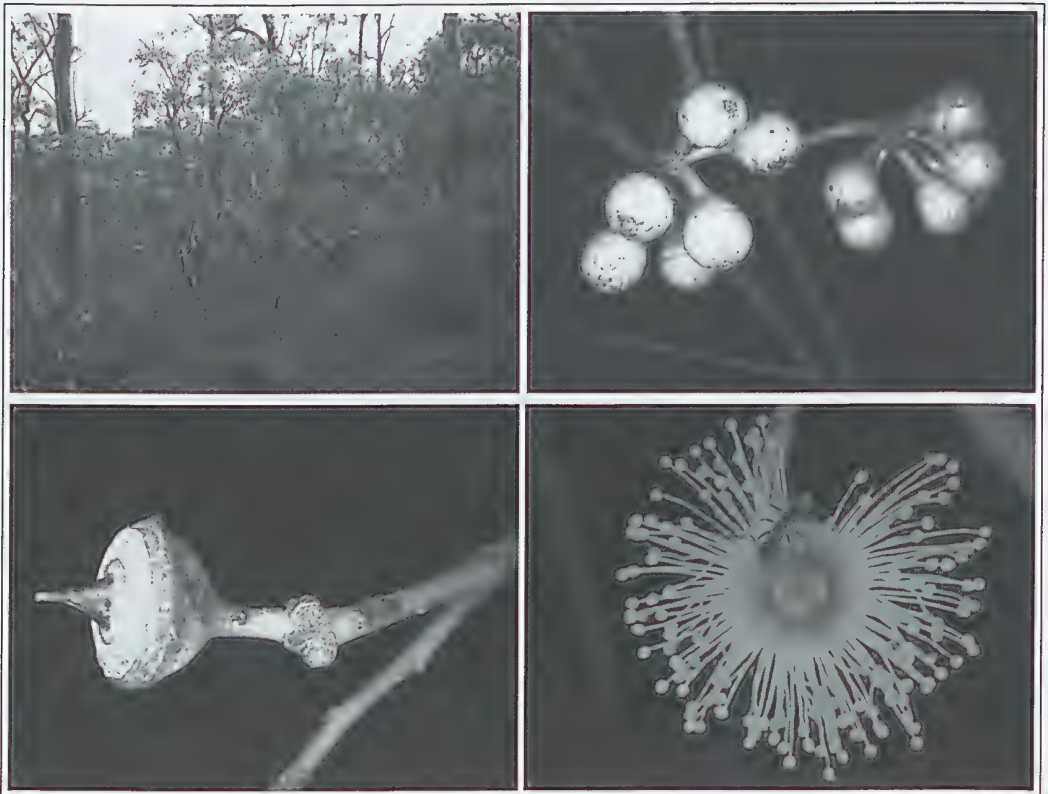


Figure 4. *Eucalyptus lane-polei* × *relict* – the only known clump. (A) habit; (B) buds; (C) flower; (D) fruit. Photos G. Wardell-Johnson.

Notes. *E. lane-poolei* × *relicta* occurs in a single stand within two kilometres of the nearest *E. relicta* and 150 kilometres south of the nearest *E. lane-poolei*. It is thus a classic phantom hybrid, arguably of considerable antiquity given the long distance it occurs away from *E. lane-poolei*. Its features are intermediate in all respects between its parents.

Acknowledgements

We are indebted to Basil Schur, who provided seedlings of *E. virginea* for our examination and retention, to Len Talbot who directed us to populations of *E. relicta*, to Barney White, who recounted aspects of the first collection of *E. virginea*, and to Andrew Brown, Tony Annels, Len Talbot, Barney White, Chris Vellios, Ian Wheeler, Basil Schur, Graham Liddelow, Luke Sweedman, Graham McCutcheon and Ian Brooker for assistance in the field. Dr Ian Brooker kindly provided the Latin diagnoses.

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A new species of *Bulbine* (Asphodelaceae) from Western Australia

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Abstract

Keighery, G.J. A new species of *Bulbine* (Asphodelaceae) from Western Australia. *Nuytsia* 15(2): 241–244 (2004). A new species of *Bulbine* Wolf, *B. pendula* Keighery, is described and illustrated. The species is confined to cracking clay wetlands in the Pilbara, Carnarvon, Ashburton and Great Sandy Desert Biogeographical Regions of arid Western Australia.

Introduction

The author is currently reviewing the taxonomy of many of the genera of the Liliaceae *s. lat.* in Western Australia, which were last studied in preparation for the “Flora of Australia” in 1987. These studies are uncovering many previously unrecognised or informally treated novelties in a wide range of genera. One previously informally recognised taxon is treated in this paper.

In her studies of the genus *Bulbine* Wolf, Watson (1986, 1987) noted that populations of *Bulbine semibarbata* from the Pilbara with pendulous flowers and fruits may deserve separate status. With the aid of recent field studies by M.E. Trudgen on this taxon in the Pilbara, the author concurs that this is a distinct taxon that deserves specific status.

Taxonomy

Key to species of *Bulbine* in Western Australia

1. Seeds winged, all stamens bearded *B. alata*
1. Seeds not winged, only three stamens bearded
 2. Flowers and capsule erect *B. semibarbata*
 2. Flowers and capsule pendulous *B. pendula*

Bulbine pendula G.J. Keighery, *sp. nov.*

A *Bulbine semibarbata* flores et fructus pendens statim dignoscenda.

Typus: 5 km E of Juna Downs Homestead, Hamersley Range, 22°51'S, 118°32'E, Western Australia, 9 Aug. 1973, M.E. Trudgen 370 (*holo*: PERTH 06088074).

Annual *herb*, roots fibrous, but not tuberous. *Leaves* basal, soft, fleshy, 2–3 mm wide at midpoint, 6–9 cm long, green, glabrous. *Scapes* 1–4, terete, erect, 12–21 cm long. *Flowers* pendulous. *Perianth segments* yellow, 7–8 mm long. *Stamens* and style inclined in opposite directions, the three inner stamens long and bearded near apex of filament, the three outer ones short and glabrous, anthers yellow-brown. *Ovules* 2 per locule; style straight, 0.5–1 mm long, stigma 3-lobed. *Capsule* pendulous on a recurved pedicel 8–35 mm long, yellow, globose, 3–4 mm long. *Seeds* without wing, brown, dull, angular, 4–5 mm long. (Figure 1A, B)

Selected specimens examined (14 seen). WESTERN AUSTRALIA: Creeks near Minilya River, 31 Aug. 1932, C.A. Gardner 3258 (PERTH); W boundary fence, c. 25 km W of homestead, adjacent to Hamersley monitoring site No. 1, Hamersley Station, 22°18'S, 117°28'E, 5 Aug. 1998, L.J. Ingram 5580 (PERTH); 14 km E of Mount Palgarve, Ullawarra Station, Barlee Range, 2 Aug. 1989, S. van Leeuwen 662A (PERTH); c. 100 m S of HGM site 30 from Silvergrass project area, c. 70 km NW Tom Price, 22°18'S, 117°15'E, 1 Sep. 1998, M. Maier MXM 001 (PERTH); c. 8 km E of Hamersley Station Homestead on track to Cooks Yards, 22°21'S, 117°46'E, 6 Sep. 1995, A.A. Mitchell PRP707 (PERTH); 2.3 km north-north-west of Cooks Bore, Hamersley Station, 22°21'S, 117°47'E, Western Australia, 5 Sept. 1992, M.E. Trudgen 11430 (PERTH); Between Gap Well and the Nanutarra to Wittenoom road on Hamersley Station, 22°26'S, 117°47'E, 5 Sept. 1992, M.E. Trudgen 10620 & S.M. Maley (PERTH); Piedawarra Flats, Mt Augustus, 7 July 1971, D.G. Wilcox s.n. (PERTH); Rudall River, 22°35'S, 122°10'E, 14 Aug. 1971, P.G. Wilson 10502 (PERTH).

Distribution. Arid Western Australia in the Carnarvon, Ashburton, Pilbara and Great Sandy Desert Biogeographic Regions (Thackway & Creswell 1995). These occurrences are well to the north of records for *Bulbine semibarbata*. (Figure 1C)

Habitat. Recorded as occurring on cracking red clay soils in tussock grasslands of *Astrebla pectinata* or mixed herbfields dominated by *Polymeria longifolia*, *Astrebla elymoides* and *Dichanthium sericeum* (Trudgen pers. comm.). Populations range from small to many hundreds of plants in these habitats.

Flowering period. Flowering recorded, from August to September, probably after winter rains. Mature fruits and seeds produced as flowering ends in September.

Conservation status. The species is conserved in Karijini National Park, Rudall River National Park and probably in Mount Augustus National Park. Not considered under threat.

Etymology. The specific name refers to the pendulous flowers and fruit.

Notes. *Bulbine* is one of a number of genera of Liliaceae s. lat., including *Thysanotus* R. Br., *Tricoryne* R. Br. and *Wurmbea* Thunb., which have recently discovered or recognised taxa present in the arid zone in and around the Pilbara. This is of considerable biogeographic interest as nearly all of these genera are species rich in southern Australia, and the new taxa are closely related to southern species. More discoveries of these taxa can be expected.



Figure 1. A - *Bulbine pendula*, whole plant in fruit; B - seed; Drawn from A.A. Mitchell PRP707 (PERTH). C - Distribution of *Bulbine semibarbatum* • and *Bulbine pendula* ♦ .

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A taxonomic review of the genus *Agrostocrinum* (Phormiaceae)

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Abstract

G.J. Keighery, A taxonomic review of the genus *Agrostocrinum* (Phormiaceae). *Nuytsia* (15)2: 245–252 (2004). The genus *Agrostocrinum* F. Muell. is reviewed. Two species are recognised, *A. hirsutum* (Lindl.) Keighery and *A. scabrum* (R. Br.) Baillon, both confined to southern Western Australia. A distinctive inbreeding maritime race of the latter, found in scattered populations on granites along the south coast, is described as a new subspecies, *A. scabrum* subsp. *littorale* Keighery.

Introduction

This paper is the second part of a series dealing with the taxonomy of the Western Australian Liliaceae *sens. lat.*, arising from the author's extensive studies on the biology of these plants. The first (Keighery 2004) dealt with a new species of *Bulbine* Willd.

The genus *Agrostocrinum* (Phormiaceae) is endemic to south Western Australia. Although a distinct genus, it is related by chemical, leaf anatomy, seed and cytological characters to *Dianella* Lam. and has been recently placed in the family Phormiaceae (Dahlgren *et al.* 1985). In his treatment of the genus for "Flora of Australia", Henderson (1987) maintained a single widespread species, *A. scabrum*. Extensive field observations by the current author have led to this review in which two largely allopatric species are recognized, one of them with two subspecies.

Biology of the genus

Members of the genus *Agrostocrinum* are short-lived tufted rhizomatous herbs, that grow and flower rapidly from seed, and flowering can occur the next spring after germination. Although possessing a short rhizome, both species, like *Stypandra* R.Br. (Pate & Dixon 1982), have tuberous roots as storage organs.

Plants can survive and resprout after mild fires but are generally killed by hot summer fires and regenerate from seed. *Agrostocrinum hirsutum* is stimulated to germinate and grow after fire and occurs in large populations for 4–7 years after fire in the southern forests. On shallow soils in the northern Jarrah forest, large numbers of plants of *Agrostocrinum hirsutum* died during the series of hot dry summers

and drought affected autumns of 2000/2001, suggesting that they are comparatively short lived. At the Brixton Street wetlands plants of *A. scabrum* were at least 8 years old before being killed by a summer fire.

Agrostocrinum has diurnal, nectarless flowers with poricidal anthers that, like those of *Dianella* and *Stypandra* are buzz-pollinated by solitary bees. Normally only a few flowers are open on a single plant per day, ensuring several plants are visited in the normally large populations of both species.

Unlike *Dianella* the genus is largely self-incompatible, with black anthers that are twisted away from the style preventing self-pollination, except in the case of the new maritime subspecies. In this inbreeding taxon the anthers are straight and level with the style, which is closely surrounded by the anthers. This subspecies also can be clonal in its growth habit, like members of the related genus *Stypandra*. While most populations of both species are diploid ($n=8$) at least in the case of the Cape Leeuwin population the maritime taxon is polyploid on $n=16$ (Keighery 1984).

Agrostocrinum also differs from *Dianella* in producing capsules not berries. The shiny black seeds are dispersed from the capsule in early summer in both species.

Taxonomic treatment

***Agrostocrinum* F. Muell. , Fragm. 2: 94 (1860). Type: *Agrostocrinum stypanroides* F. Muell.**

Tufted *perennials* with a number of flowering stems annually renewed from a short or rarely elongated rhizome 10–40 cm diam., rarely elongated to over 1 m. *Roots* tuberous (not fibrous as frequently stated), slender, yellow brown or yellow when alive. *Aerial stems* erect, not or few-branched, flattened, both margins entire. *Leaves* distichously inserted at base, concentrated on lower part of the stem, linear, parallel-veined, basally strongly compressed, ensiform, unifacial, then v-shaped and finally open and flat towards apex, apex acute. *Inflorescence* terminal, a continuation of the aerial stems, unbranched or more or less corymbose, bracteate, glabrous or scabrid. *Main bract* leaf-like, linear. *Pedicels* glabrous or scabrid. *Flowers* bisexual, slightly zygomorphic, pedicellate. *Perianth segments* 6, subequal, slightly united at the base, where thickened and persistent, upper parts membranous, twisted after flowering then deciduous, blue; sepals glabrous on inner surface, sometimes scabrid on outer surface; petals slightly larger than sepals, glabrous. *Stamens* 6, black, shorter than perianth, straight or curved away from style; filament glabrous; anther longer than the filament, tapering upwards, dehiscing by pores, introse, shortly appendaged basally. *Ovary* superior, 3-locular; ovules 2 per locule, basal. *Style* filiform, straight or curved to one side; stigma minute, papillose. *Fruit* a loculicidal capsule, more or less globose but crested, subtended by the persistent perianth base, either scabrid or glabrous. *Seeds* 1 or 2 per locule, black, smooth, shiny.

Key to members of the genus *Agrostocrinum*

1. Tepals 7–9 mm long. Inflorescence not exceeding leaves 1b. *A. scabrum* subsp. *littorale*
1. Tepals 12–16 mm long. Inflorescence exceeding leaves
 2. Inflorescence axis glabrous. Leaves broad, glaucous 1a. *A. scabrum* subsp. *scabrum*
 2. Inflorescence axis scabrid. Leaves narrow, green 2. *A. hirsutum*

1. *Agrostocrinum scabrum* (R. Br.) Baillon, *Bull. Mens. Soc. Linn. Paris* 142: 1119 (1894); Hist. 1. 12: 541 (1894). – *Stypandra scabra* R.Br., *Prod.* 279 (1810). *Type*: Bay 1 [Lucky Bay, Western Australia], R. Brown Inter Australiense 5678. (*lecto*: BM (extreme right hand piece on sheet bearing Robert Brown's tag labelled 'Anthericum, Bay 1, South Coast. 1 sp. *Stypandra scabra* prodr.') *fide* Henderson, *Fl. Australia* 45: 466 (1987); *isolecto*: BM).

Tufted *perennial herb*, with 4–10 flowering stems 0.15–1 m tall; rhizome short or rarely elongated to several m long. *Roots* yellow-brown, 1–2 mm diam. *Aerial stems* generally not branched, flattened, sharp along sides, both margins entire. *Leaves* green or glaucous, 4–40 cm long, 1.5–6 mm wide, ensiform, unifacial for basal 30 mm, open and flattened for top 10–15 mm, apex acute. *Inflorescence* terminal, glabrous, a continuation of the aerial stems, corymbosely branched to 30 cm long and 30 cm wide, either greatly or not exceeding the leaves, bracteate. *Main bract* leaf-like, linear, 10–60 mm long, glabrous. *Floral bracts* leaf-like, 4–10 mm long. *Pedicels* glabrous, 10–25 mm long. *Perianth segments* dark blue or blue (white flowered plants have been recorded), 8–16 mm long, 4–8 mm wide, glabrous on both sides or with a few scabrid hairs on outer surface of sepaline tepals. *Anthers* twisted away or clustered around style, c. 6 mm long. *Style* 7–9 mm long. *Fruit* to 5 mm wide, glabrous. *Seeds* c. 3 mm long.

Distribution. Extends from near Watheroo to Cape Arid in Western Australia. There are a few scattered localities on clay soils on the Swan Coastal Plain, on granites through the northern Jarrah Forest and on coastal granites west of Albany to Augusta.

Notes. Two subspecies are recognised. One is a widespread robust glaucous outbreeding form that occupies most of the species range. The other is a green leaved, inbreeding form that occurs on coastal granites from Mt Manypeaks to Augusta.

1a. *Agrostocrinum scabrum* (R. Br.) Baillon subsp. ***scabrum***

Tufted *perennial herb* from a short or rarely elongated rhizome 20–40 cm diam., with 4–10 flowering stems. *Leaves* glaucous, 30–40 cm long, 5–8 mm wide, ensiform, unifacial for basal 30 mm, lamina open and flat for top 10–15 mm. *Inflorescence* terminal, exceeding the leaves, to 30 cm long and 30 cm wide. *Pedicels* 20–25 mm long. *Tepals* dark blue, 14–16 mm long, 6–8 mm wide, glabrous. *Anthers* twisted away from style, shorter than style. *Style* 8–9 mm long.

Selected specimens examined. WESTERN AUSTRALIA: Mt Ney, 33°24'S, 122°28'E, 1 Oct. 1983, M. Burgman & S. McNee 2509 (PERTH); 6 km N of Bolgart, 31°13'S, 116°30'E, 3 Nov. 1956, J.W Green 551 (PERTH); Tagon Bay, Cape Arid National Park, 33°52'S, 122°59'E, 16 Oct. 1991, W. Greuter 22887 (PERTH); Brixton St, Beckenham, 32°01'S, 115°58'E, 19 Nov. 1982, G.J. Keighery 5391 (PERTH); Charles Gardner Reserve, S of Tammin, 31°52'S, 117°29'E, 17 Nov. 1970, R.D. Royce 9319 (PERTH).

Distribution. Extends from near Watheroo to Cape Arid Western Australia. There are a few isolated populations on clay soils on the eastern side of the Swan Coastal Plain from near Perth to Waterloo and in the Jarrah Forest around granites. Apparently there is a disjunction between the northern populations and those along the south coast. (Figure 1A).

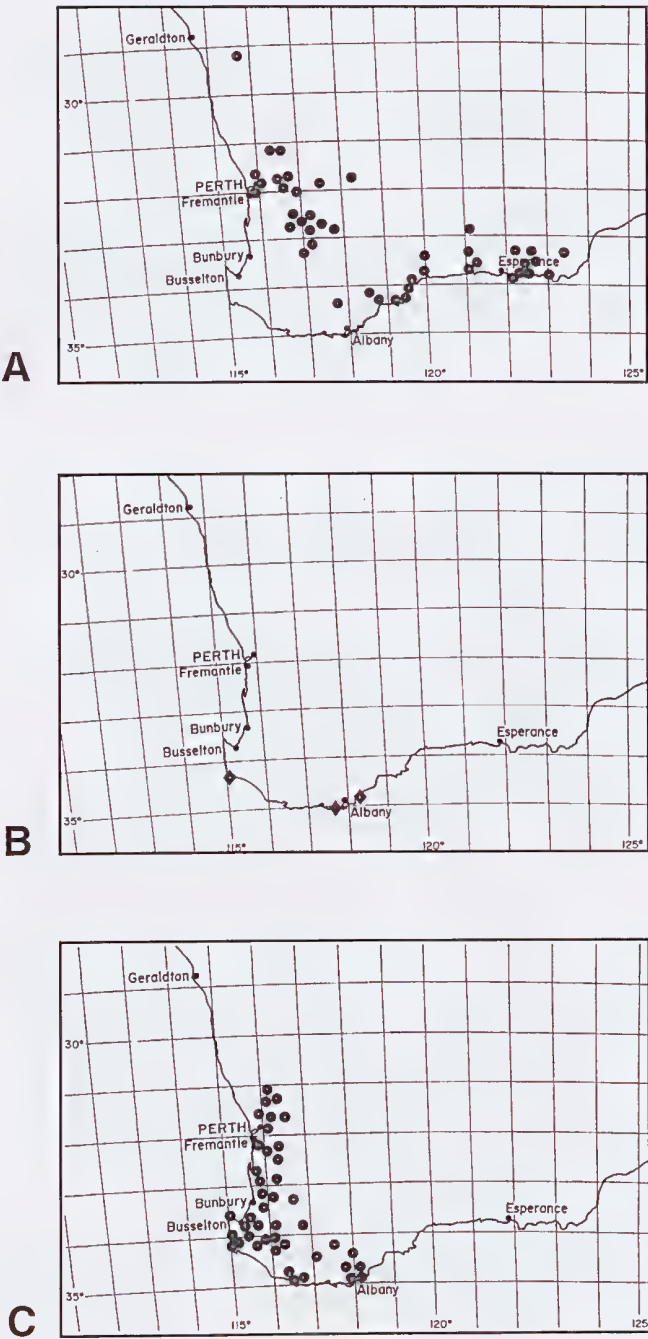


Figure 1. Distribution maps. A – *Agrostocrinum scabrum* subsp. *scabrum*; B – *A. scabrum* subsp. *littorale*; C – *A. hirsutum*.

Habitat. In a wide variety of plant communities ranging from Eucalypt woodlands, *Banksia* woodlands, mallee, shrublands and heath. Usually on lateritic or duplex yellow sands in the Avon – Wheatbelt IBRA Bioregion (Thackway and Creswell 1995), but also on grey sands and sandy clays. Along the south coast the species is frequently found on granite and quartzite hills.

Phenology. Flowers: September to November, extending into December on the south coast. Mature capsules are found from November to January.

Conservation status. Widespread and well conserved.

Etymology. From the Latin *scabrum*, meaning rough or gritty to the touch, on the account of numerous small projections, from the few scabrid hairs found on the inflorescence in the south coast variant of the species.

Discussion. In the field this subspecies can be readily distinguished from *Agrostocrinum hirsutum* by its undivided aerial stems and larger glaucous leaves. The inflorescence is larger, more branched and open with long glabrous pedicels and peduncles with no or few glandular hairs. The sepals are not scabrid on the outer surface.

This subspecies appears to be composed of two disjunct variants. Populations from the northern part of the species range are large robust plants with broad glaucous leaves and completely glabrous flowers and inflorescence. These populations occur on clay soils on the Swan Coastal Plain, rarely on granites along the Darling Escarpment, then disjunct to the western Wheatbelt (Bolgart, Northam, York, inland to Quairading and Muntadgin and south to Kojonup).

The other variant is a more slender plant with thin leaves and, especially near the coast, a few scabrid hairs are found on the floral parts. It occurs in the south-east portion of the species range from near Albany to Israelite Bay, usually on granites, quartzite hills and ranges. There is, however, overlap in characters along the inland margins and the disjunction may prove to be less distinct with more intensive collecting.

1b. *Agrostocrinum scabrum* subsp. *littorale* Keighery, *subsp. nov.*

Differt a *Agrostocrinum scabrum* statura minore, folia viridia, inflorescentia brevis, non excedens folia et flores parvus.

Typus: Mount Manypeaks, 40 km E of Albany, 34°54' S, 118°16' E, 27 Nov. 1987, G.J. Keighery 8846 (*holo:* PERTH 01963481).

Rhizomatous *perennial herb*, to 15 cm tall by 1 m wide. *Leaves* green, 4–12 cm long, 1.4–2.5 mm wide. *Inflorescence* glabrous, not exceeding the leaves. *Pedicels* 10–13 mm long. *Tepals* blue, 7.8–8.6 mm long, outer surface with a few scabrid hairs towards the base. *Anthers* straight, clustered around style, equal in length to the style. *Style* c. 7 mm long.

Other specimens examined. WESTERN AUSTRALIA: Cape Leeuwin by Rangers House, Western Australia, 4 Nov. 1978, G.J. Keighery 1914 (KP, PERTH); Mutton Bird Island, G.J. Keighery 5809 (PERTH).

Distribution. Western Australia. Known from three disjunct populations at Mt Manypeaks, Mutton Bird Island and Cape Leeuwin (Figure 1B). All of these populations are within the range of *A. hirsutum*. At Mt Manypeaks the two are parapatric within 50 m (vouchers *G.J. Keighery* 8845 and *G.J. Keighery* 8846, PERTH) and no intermediates were recorded.

Habitat. Found on shallow granite loams in low open heath on granite slopes overlooking the sea.

Flowering and fruiting time. October to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. Occurs in Leeuwin–Naturaliste and the proposed Waychinicup National Parks.

Etymology. From the Latin *littoralis* – pertaining to the sea shore, a reference to this subspecies occurring close to the ocean.

Discussion. This distinctive inbreeding subspecies of *Agrostocrinum scabrum* differs in having green leaves, smaller flowers than the type subspecies, shorter erect anthers that are as long as the style and which cluster around the stigma. The inflorescence does not exceed the leaves and at Cape Leeuwin the plants are clonal and polyploid. It could be argued that this taxon deserves specific status.

2. *Agrostocrinum hirsutum* (Lindl.) Keighery, *comb. nov.*

Caesia hirsuta Lindl., Sketch Veg. Swan Riv. Col. 57 (1840). *Type:* Swan River Colony [Western Australia], syn: Drummond 775 & 776 CGE, *n.v.* (photo *fide* A.S. George).

Agrostocrinum stypanroides F. Muell., Fragm. Phytog. Austr. 2 (13): 95 (1860). *Type:* Vasse River, Oldfield (*lecto:* MEL 1531244, *fide* Henderson, Fl. Australia 45: 466 (1987)). *Excluded syntypes:* Hay River, Oldfield (MEL 1531242, 1531245); Tone River, Oldfield 632 (MEL 1531205); Phillips Flats, Oldfield 130-1 (MEL 1531243). The excluded syntypes are all of *Agrostocrinum scabrum*.

Slender tufted *perennial herb*, with 3–8 flowering shoot to 0.6 cm tall, usually less; rhizome abbreviated, 10–20 cm diam. *Roots* yellow, 15–20 cm long, 1–2 mm diam. *Aerial stems* flattened, 2–3 mm wide, sharp on sides, entire. *Leaves* green, 10–40 cm long, 2–4 mm wide, folded for basal 30–60 mm, margins smooth, entire. *Inflorescence* few-branched, 100–120 mm long, basal 30–40 mm smooth, rest scabrous. *Main bract* 30–40 mm. *Floral bracts* linear-subulate, 5–7 mm long. *Pedicels* erect, slender, 12–15 mm long, scabrous. *Perianth segments* dark blue, 12–16 mm long, 6–8 mm wide; sepals scabrid on undersurface. *Anthers* twisted away from style, *c.* 6 mm long, curved. *Style* 8–9 mm long. *Fruit* to 6 mm wide, covered with scabrid hairs. *Seeds* *c.* 3 mm long.

Other specimens examined. WESTERN AUSTRALIA: Collie, 33°22'S, 116°09'E, 2 Nov 1988, *J.J. Alford* 1074 (PERTH); Red Hill, 31°52'S, 116°03'E, 6 Nov 1958, *T.E.H. Aplin* 305 (PERTH); Castle Rock Walk, Porongurup National Park, 34°07'S, 117°55'E, 19 Nov 1983, *E.J. Croxford* 5723 (PERTH); Hooley Road, Leeuwin–Naturaliste National Park, 34°07'S, 115°01'E, 28 Nov. 1989, *N.G. Gibson & M.L. Lyons* 418 (PERTH); Coolup, 32°45'S, 115°52'E, 25 Oct. 1897, *R. Helms s.n.* (PERTH); Mount Manypeaks, 27 Nov. 1986, *G.J. Keighery* 8845 (PERTH); 22 km S of New Norcia, 31°10'S, 116°13'E, 13 Oct. 1977, *C.I. Stacey* 619 (PERTH).

Distribution. Occurs west of a line from New Norcia south to Mt Manypeaks, Western Australia. (Figure 1C).

Habitat. Usually found in woodlands (of *Eucalyptus marginata*, *E. marginata* and *Corymbia calophylla*, *C. calophylla*, *E. wandoo*, *E. cornuta*, *Banksia attenuata* / *B. menziesii*), Heath or sedgelands. Occurs often on sandy soils, lateritic soils or granites.

Phenology. Flowers September to November and extending into December in the wetter areas of the forest. Mature capsules can be found from November to February.

Conservation status. Widespread and well conserved.

Etymology. The epithet *hirsutum* refers to the scabrid hairs present on the inflorescence axis, pedicel and outer surface of the sepals.

Discussion. Lindley did not designate a type. It is likely that the species is based on a Drummond collection, of which two, *Drummond* 775 and 776. Alex George kindly searched Cambridge and located both collections, labelled as *Caesia hirsuta* in Lindley's hand. One of these could be selected as a lectotype.

Alex George compared the material and is in no doubt from the collections that this is the correct name for the western species of *Agrostocrinum*. This supposition is further enhanced by the following passage describing the species. This material was collected by Georgiana Molloy around the Vasse River and sent to England as seed. In June 1842 George Hailes of Newcastle reported (Hasluck 1955: 239) that he "had flowered the first novelty to our gardens which the seeds from Swan River you so kindly sent me two years have produced with me. I had hoped it was new and intended to ask my friend Sir William Hooker to figure it with my name of '*Caesia molloyae*', as a fitting memorial of a fair lady to whose exertions we owe so much and who has been so ungallantly overlooked by all describers of her collections, but on examining Lindley's sketch I found it was described as '*Caesia hirsuta*'."

Of particular note is that while the two species overlap little in range, they are parapatric on the Darling escarpment at Wandoo Heights in the Shire of Swan, occurring in closely adjacent habitats with no evidence of hybridization and some differentiation in flowering times (vouchers *G.J. Keighery* 16209 and 16210).

Acknowledgements

The author was able to view type material, and other collections at MEL with the assistance of the curator of Melbourne Herbarium, Jim Ross. Rod Seppelt, the Australian Botanical Liaison Officer at Kew, searched for material at Cambridge. Alex George, while on vacation in England, visited Cambridge and located the Drummond collections.

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Taxonomic notes on the *Angianthus drummondii* complex (Asteraceae: Gnaphaliinae)

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Abstract

Keighery, G.J., Taxonomic notes on the *Angianthus drummondii* complex (Asteraceae: Gnaphaliinae). *Nuytsia* 15(2): 253–260 (2004). *Angianthus drummondii* is revised and shown to be a species complex of three allopatric species. The complex comprises *A. drummondii* (Turcz.) Benth., an erect plant with long inflorescence bracts confined to fresh water clay-based wetlands; *A. platycephalus* Benth., a prostrate plant with short broad inflorescence bracts, growing in fresh to brackish clay soils, is resurrected; and a new species *A. halophilus* Keighery, an erect plant with short inflorescence bracts, found on gypsum soils, is described.

Introduction

During the last decade the Western Australian Department of Conservation and Land Management has been undertaking regional biological surveys of the Swan Coastal Plain and the Agricultural Zone of Western Australia. During these surveys we have noted many species and species complexes that required further taxonomic study. This paper forms part of a continuing series publishing the results of these studies.

Angianthus was revised by Short (1983) where he segregated 8 genera (*Cephalosorus*, *Chrysocoryne*, *Dithyrostegia*, *Epitriche*, *Hyalochalymys*, *Pleuropappus*, *Pogonolepis* and *Siloxerus*) from the previously broadly circumscribed genus *Angianthus*. The genus is now characterised by the presence of two inner flat bracts and two outer concave bracts per capitulum, the presence of one rarely two or three capitulum subtending bracts per capitulum, the usual occurrence of two florets per capitulum and the usual presence of minor receptacle axes on the general receptacle. The genus, with the proposed changes given in this paper is confined to Australia and comprises 19 species, with 15 species endemic to Western Australia.

Short (1983) delimited a number of species groups within the genus *Angianthus*. These comprised; the *A. cunninghamii* group (sole member), the *A. tomentosus* group (*A. acrohyalinus*, *A. brachypappus*, *A. cornutus*, *A. conocephalus*, *A. cyathifer*, *A. glabratus*, *A. micropodioides*, *A. microcephalus*, *A. milnei*, *A. prostratus* and *A. tomentosus*) and the *A. drummondii* group (*A. drummondii*, *A. preissianus* and *A. pygmaeus*). Since this revision Short (1990) has described a new species of *Angianthus*, *A. newbeyi*, related to *A. conocephalus* from the northern Avon-Wheatbelt of Western Australia. This species is part of the *Angianthus tomentosus* group.

The species in the *A. drummondii* group are well defined, however, there is considerable variation within the currently circumscribed species *Angianthus drummondii* and *A. preissianus*.

This paper deals with the *Angianthus drummondii* complex, which is considered to contain three closely related allopatric species.

Amended keys to *Angianthus* (incorporating changes from this paper)

A. Amended Key to *Angianthus* species (Adapted from Short, 1983, page 156)

- 9. Florets 3- or 4- lobed; pollen grains 16-60 per anther **A. preissianus**
- 9. Florets (4) 5- lobed; pollen grains c. 350-500 per anther
 - 10. Major axis prostrate to decumbent
 - 11. stemless dwarf plants **A. prostratus**
 - 11. Major axis decumbent to prostrate, axis 5-8 cm long **A. platycephalus**
 - 10. Major axis erect
 - 12. Compound heads large, broadly to very broadly ovoid, subtended by linear silvery bracts greatly exceeding inflorescence **A. drummondii**
 - 12. Compound heads small, broadly ovoid, subtended by short bracts scarcely exceeding inflorescence **A. halophilus**

B. Amended Key to *Angianthus* species (after Blackall & Grieve, 1982, p. 814)

Section 4

- A. Stems 5-8 cm or more long **B**
- A. Stemless dwarf plants
 - B. Florets 5 partite
 - C1. Plant prostrate, Floral leaves ovate acuminate, pappus a short jagged ring readily falling off with corolla **A. platycephalus**
 - C2. Plant erect or decumbent **D**
 - D1. Outer involucral bracts linear, long acuminate, 11-13 mm long **A. drummondii**
 - D2. Outer involucral bracts linear - oblanceolate, acuminate, 5-7 mm long **A. halophilus**

Taxonomic Treatment

Angianthus drummondii (Turcz.) Benth. Flora of Australia 3: 566 (1867). - *Skirrhophorus drummondii* Turcz., Bull. Soc. Imp. Naturalistes Moscou 24(1): 188 (1851). - *Stylonocerus drummondii* (Turcz.) Kuntze, Rev. Generum Pl. 367 (1891). Type: Nova Hollandia [Western Australia], J. Drummond III no. 123 (holo: KW, n.v.; iso: MEL 541210, PERTH 01058584, PERTH 01058592).

Annual herb, major axes mostly simple, erect or 3/5 erect branches from a basal node, 40–80 mm long, sparingly hairy. *Leaves* opposite, linear, soft and succulent, 0.5–1.0 mm wide, 8–17 mm long, basal leaves not longer than stem leaves, grey, hairy, apex acute. *Capitula* over 60 in compound heads, hemispherical, 8–9 mm wide. *Bracts subtending compound heads* conspicuous, forming an inflorescence involucre around the head, exceeding the width of the head in 3/4 rows. Outer row of 6–8 bracts 11–13 mm long, silvery grey, linear with an enlarged base covered in dense silver grey hairs becoming

almost glabrous towards the acute apex. Second whorl of 8 bracts, linear – lanceolate, 7–8 mm long, grey silvery hairy throughout, enlarged base with dense cottony hairs, apex acute. Inner whorl of 8 bracts lanceolate to triangular, some 4–5 mm long,, others 6–7 mm long, grey silvery hairy throughout, enlarged base with dense cottony hairs, apex acute. General receptacle a convex axis. *Capitulum subtending bracts* 2, obovate, c. 2 mm long, 2 mm wide, scarious, glabrous. *Capitula bracts*, 2, concave, c. 2 mm long, midrib sparsely hairy, flat bracts 2, obovate, gradually tapering towards base, 2 mm long, 1 mm wide, glabrous, with an entire wing like extension from the adaxial surface. *Flowers* 2, corolla 5 lobed, tube tapering gradually towards the base, 1.6–1.8 mm long. *Cypsela* +/- obovoid, 0.8 mm long, 0.3 mm in diameter. *Pappus* a small jagged ring, c. 0.1 mm long, soon deciduous. (Figure 1 A-F)

Other specimens examined. WESTERN AUSTRALIA: Yoongarrillup Townsite Reserve, 34° 43'S, 115° 26'E, 14 Oct. 1992, B.J. Keighery & N. Gibson 004 (PERTH); Fish Road Nature Reserve, 33° 43'52" S, 115° 23' 20" E, 14 Oct. 1992, B.J. Keighery & N. Gibson 007 and 008 (PERTH); Ruabon Nature Reserve, 33° 39'S, 115° 30'E, 08 Nov. 1992, B.J. Keighery & N. Gibson 653 (PERTH); 2 km N of Waroona, 32° 49'S, 115° 44'E, 27 Nov. 1993, G.J. Keighery s.n. (PERTH); Tuart Forest, NW Ludlow, 33° 37'S, 115° 33'E, 13 Dec. 1994, G.J. Keighery 13226 (PERTH); Byrde Swamp Nature Reserve, 32° 26'S, 115° 49'E, 27 Nov. 1997, G.J. Keighery 15013 (PERTH).

Distribution. Recorded from the Swan Coastal Plain IBRA Bioregion (Environment Australia, 2000) only. (Figure 2).

Habitat. Occurs on fresh seasonally wet clay soils either grey or brown under *Melaleuca uncinata* / *Melaleuca viminea* shrubland or rarely under *Melaleuca cuticularis* low woodland.

Flowering Period. Flowering in late spring, from October to December. Mature fruits and seeds are found in late December to January. Seeds are held in the inflorescence on the dried dead plants until the rains of the following winter.

Conservation Status. Conservation Codes for Western Australian Flora: Priority Three. Localized but well conserved, being represented in at least three nature reserves (Ruabon, Fish Road and Byrde) and one national park (Tuart Forest).

Etymology. Named after James Drummond, the foremost colonial collector for Western Australia.

Notes. Differs from other members of the complex in the long slender outer bracts, the multiple rows of involucre bracts, and the large number of flowers in the head giving the head a hemispherical appearance. The outer involucre bracts are held at right angles to the head during flowering, their bright shiny metallic-grey-white colour contrasting with the bright yellow florets give the flowering plants a star like appearance when viewed from above.

Angianthus platycephalus Benth., *Flora Austral.* 3: 566 (1867). - *Stylonocerus drummondii* (Benth.) Kuntze, *Rev. Gen. Pl.* 367 (1891). *Type:* Wet places, Tone River [Western Australia], *Oldfield* 85 (*holo:* K, photo seen; *iso:* MEL 541607, PERTH 01059580).

Annual herb, major axes prostrate, 15–25 mm long, densely cottony hairy when young becoming sparser with age, simple. *Leaves* opposite, +/- linear, soft and succulent, 0.5–1 mm wide, basal leaves longer than stem leaves, 8–15 mm long, stem leaves 4–7 mm long, grey, hairy, apex long mucronate.

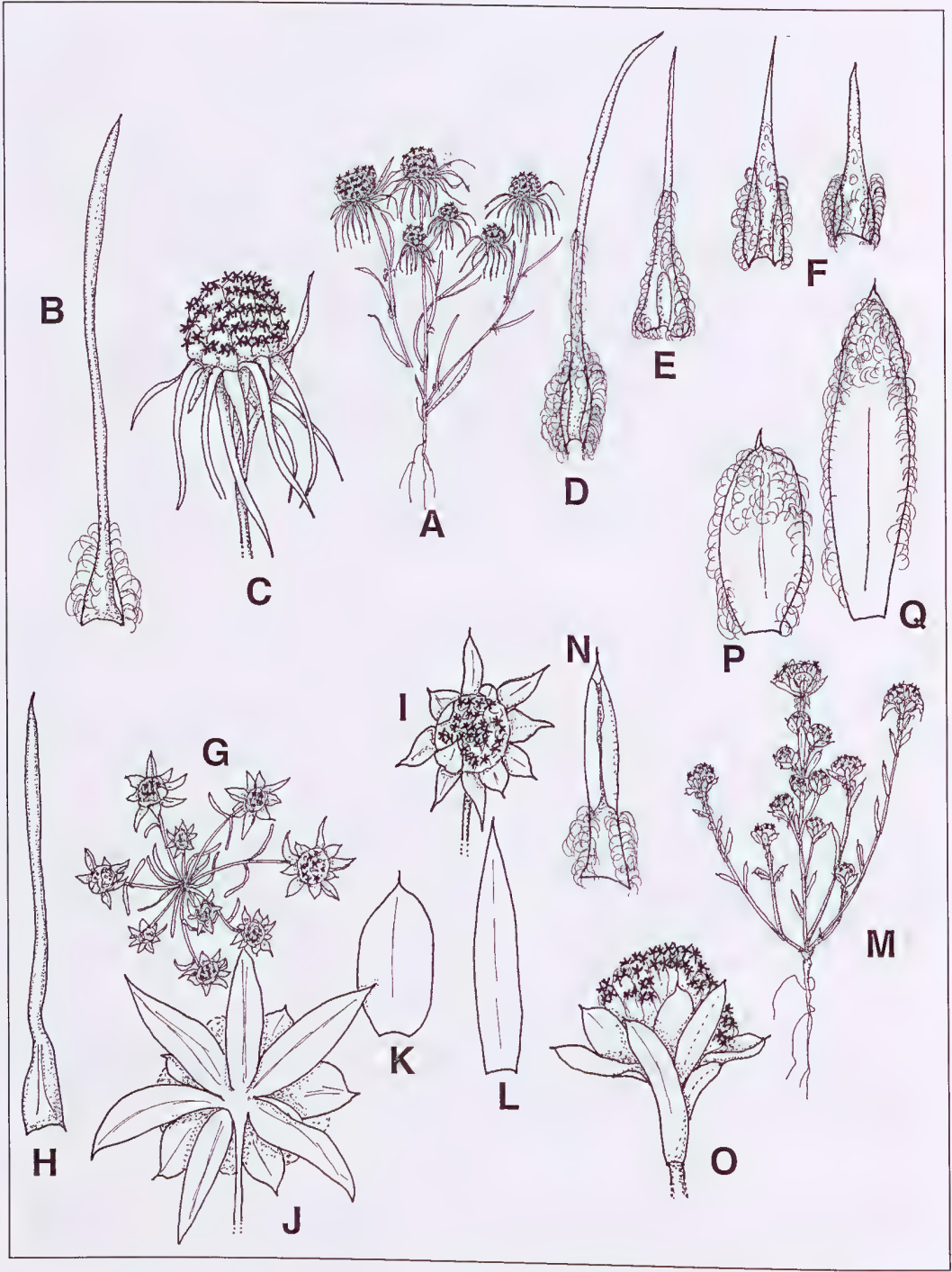


Figure 1: A-F. *Angianthus drummondii*, drawn from G.J. Keighery 15013 (PERTH). A – habit, B – leaf, C – inflorescence, D – outer involucre bract, E – involucre bract of second whorl, F – inner involucre bracts; G-L. *Angianthus platycephalus*, drawn from Keighery 10499 (PERTH). G – habit, H – leaf, I – top view of inflorescence, J – basal view of inflorescence, K – leaf, L – inner involucre bract; M-Q. *Angianthus halophilus*, drawn from Short 2361 (PERTH). M – habit, N – leaf, O – inflorescence, P – outer involucre bract, Q – inner involucre bract. Scale bar = 10 mm (A, G), 5 mm (C, I, M), 1 mm (B, D-F, H, J-L, N-Q).

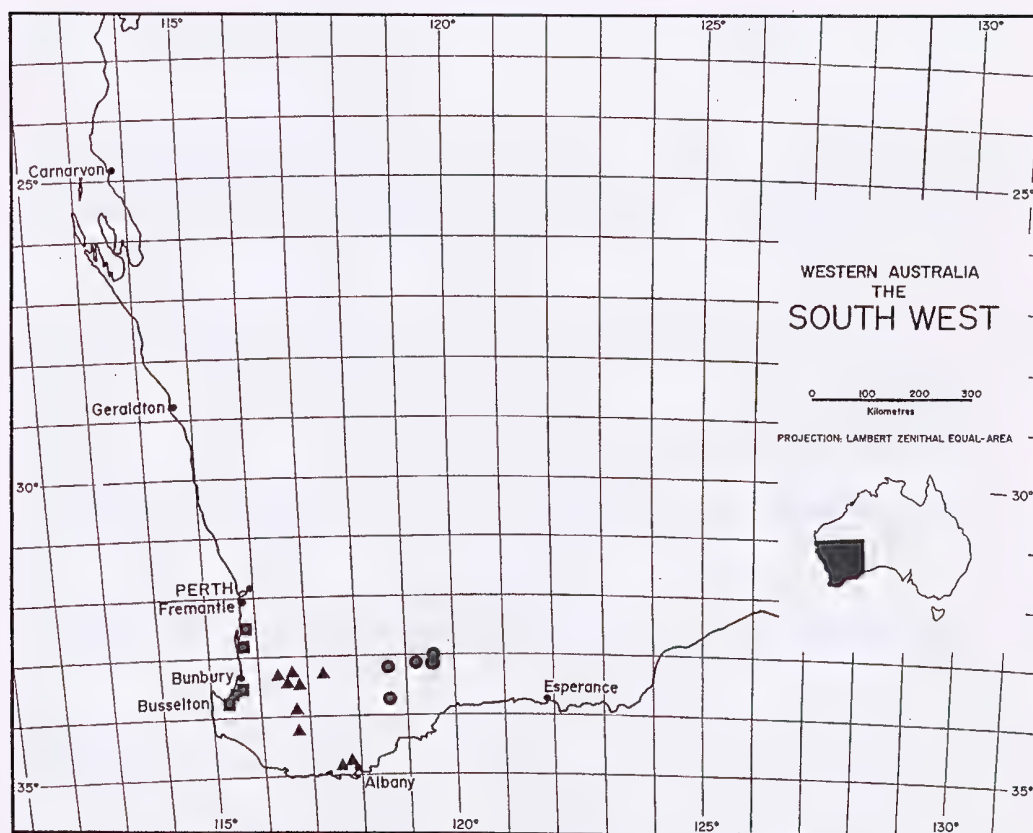


Figure 2: Distribution of members of *Angianthus drummondii* complex: *Angianthus drummondii* ■, *Angianthus platycephalus* ▲, *Angianthus halophilus* ●.

Capitula in compound heads, depressed ovoid to hemispherical, 6 – 8 mm wide. *Bracts subtending compound heads* conspicuous, forming an inflorescence involucre around the head, exceeding the width of the Head, comprised of c. 10 bracts in two whorls, outer leaf like, linear – lanceolate, 5–7 mm long, c. 2 mm wide, apex acute, inner elliptical, silvery grey, apex mucronate, 4 mm long, 3 mm wide. General receptacle a small convex axis. *Capitulum subtending bracts* 1(2), obovate, c. 2 mm long, 2 mm wide, scarious, glabrous. *Capitula bracts*, 2, concave, c. 2 mm long, midrib sparsely hairy, flat bracts 2, obovate, gradually tapering towards base, 2 mm long, 1 mm wide, glabrous, with an entire wing like extension from the adaxial surface. *Flowers* 2, corolla 5 lobed, tube tapering gradually towards the base, 1.6–1.8 mm long. *Cypselas* +/- obovoid, 0.8 mm long, 0.3 mm in diameter. *Pappus* a small jagged ring, c. 0.1 mm long. (Figure 1 G-L).

Other specimens examined. WESTERN AUSTRALIA: Lake Muir Nature Reserve, 64 km E of Manjimup, 34° 26'S, 116° 41'E, 24 Nov. 1994, A.R. Annels 5005 (PERTH); 23.5 km E of Collie, 33° 25'S, 116° 33' 25"E, 30 Oct. 1997, R.J. Cranfield 11524 (PERTH); 9.2 km SSW of Bowelling on Trigwell Bridge road, 22 Nov. 1998, V. Crowley 799 (PERTH); 6 km W of Bowelling on Coalfields Road, 28 Oct. 1998, V. Crowley 800 (PERTH); 9.5 km from Bowelling on Bowelling-Duranillin Road, 33° 27'S, 116° 34'E, 17 Nov. 1997, R. Davis 4499 (PERTH); south coast area – Walpole/Albany/Stirling Ranges, 14 Dec. 1966, Ehrendorfer 181 (PERTH); Casuarina Nature Reserve, Wagin area, 33° 18' 29" S, 117° 20' 36" E, 18 Feb. 1988, Halse s.n. (PERTH); Wilson Inlet, W. side of mouth of Hay River, 34° 58'S, 117° 27'E, B.G. Hamersley 1710 (PERTH), Duranillin, 33° 31'S, 116° 48'E,

04 Nov. 1988, *G.J. Keighery* 10499 (PERTH); Hotham River, Darling Ranges, 12 Nov. 1904, *M*** A., s.n.* (PERTH)

Distribution. Recorded in the Jarrah Forest and Warren IBRA Bioregions (Environment Australia, 2000), from the Hotham River to Wilson's Inlet, near Denmark, Western Australia. (Figure 2).

Habitat. Occurs on non-saline seasonally wet clay soils under low *Verticordia* heath, *Eucalyptus wandoo* woodland on alluvial flats or *Melaleuca uncinata* / *Melaleuca viminea* shrubland.

Flowering Period. Flowering in late spring, from October to November. Mature fruits and seeds are found in late December to January. Seeds are held in the inflorescence on the dried dead plants until the rains of the following winter.

Conservation Status. Widespread and well conserved.

Etymology. *Platycephalus* from the Greek for flat head, probably a reference to the low rounded inflorescence compared to *Angianthus drummondii*.

Notes. *Angianthus platycephalus* differs from *Angianthus drummondii* in having a prostrate habit, longer basal leaves, simple floral axis and the short broad inflorescence bracts. This habit means that the species keys to *A. pygmaeus* if couplet 3 is not amended in Short (1983, p. 156).

The collection from Wilson's Inlet (*Hamersley* 1710) is almost glabrous and may be better placed in an unnamed species allied to *A. preissianus*. There are two other collections from saline sites on the Swan Coastal Plain (*Worz* 04.10.16 and *Keighery* 14165) that are this taxon. Further studies of the *Angianthus preissianus* complex are required to resolve this collection.

Angianthus halophilus* Keighery, *sp. nov.

A. platycephalae Bentham affinis, differt foliis brevis et latis, apex mucronatus et inflorescentia bracteis non excedens inflorescentia.

Typus: western edge of Lake King, 33° 05'S, 119° 31' E, Western Australia, 10 November 1983, *P.S. Short & L. Haegi* 2360 (*holo:* PERTH 751650).

Annual herb, major axes erect to spreading, 2-6 axes from basal node, 15-50 mm long, densely grey cottony hairy when young becoming sparser with age, simple. *Leaves* opposite, linear to linear-lanceolate, soft and succulent, 0.5-1 mm wide, basal leaves longer than stem leaves, -15 mm long, stem leaves 4-7 mm long, pubescent with long simple grey hairs, apex long mucronate. *Capitula* in compound heads, depressed ovoid to hemispherical, 6-8 mm wide. *Bracts subtending compound heads* forming an inflorescence involucre around the head, equal to or just exceeding the width of the head, comprised of c. 10 bracts in two whorls, outer leaf like, covered with a silvery grey pubescence, linear-ob lanceolate, 5-7 mm long, c. 2 mm wide, apex acute, inner oblanceolate-elliptical, silvery grey, apex mucronate, ca. 4 mm long, ca. 1.5 mm wide. General receptacle a small convex axis. Flowers 30-60 per head. *Capitulum subtending bracts* 1(2), obovate, c. 2 mm long, 2 mm wide, scarious, glabrous. *Capitula bracts*, 2, concave, c. 2 mm long, midrib sparsely hairy on back, flat bracts 2, obovate, gradually tapering towards base, 2 mm long, 1 mm wide, glabrous, with an entire wing like extension

from the adaxial surface. *Flowers* 2, corolla 5 lobed, tube tapering gradually towards the base, ca. 2 mm long. *Cypsel*a +/- obovoid, 0.8 mm long, 0.3 mm in diameter. *Pappus*, absent. (Figure 1 M-Q).

Other specimens examined. WESTERN AUSTRALIA: 14.6 km E of Lake Grace, 33° 06'S, 118° 37'E, 6 Oct. 1994, *R.J. Bayer* 94084 (PERTH); western side of Lake King, 6 Oct. 1994, *R.J. Bayer* 94090 (PERTH); Lake King, towards eastern edge, 3 Nov. 1965, *A.S. George* 7293 (PERTH); Lake Cairlocup, 33° 44'S, 118° 44'E, 23 Oct. 1983, *K.R. Newbey* 9805 (PERTH); western edge of Lake King, 33° 05'S, 119° 31'E, 10 Nov. 1983, *P.S. Short & L. Haegi* 2361 (PERTH).

Distribution. Recorded in the Avon-Wheatbelt and Mallee IBRA Bioregions (Environment Australia, 2000), from Lake Cairlocup, Lake Grace and Lake King, Western Australia. (Figure 2).

Habitat. Occurs on low gypsum rich dunes in saline lakes under *Halosarcia* succulent shrubland or under *Melaleuca* shrubland over *Halosarcia*.

Flowering Period. Flowering in late spring, from October to November. Mature fruits and seeds are found in late December to January. Seeds are held in the inflorescence on the dried dead plants until the rains of the following winter.

Conservation Status. Conservation Codes for Western Australian Flora: Priority Three. Present in at least two conservation reserves.

Etymology. *Halophilus* from the Greek *halos*: salt and *philus* for loving, a reference to the saline gypsum dunes where this species occurs.

Notes. *Angianthus halophilus* is closely related to *Angianthus platycephalus* but differs in the short broad leaves with a pungent apex and very short broad inflorescence bracts, which do not exceed the head.

Acknowledgements

The author was able to view type material and other collections at the National Herbarium of Victoria in Melbourne with the assistance of the curator and staff of this institution. Fieldwork was funded under the Western Australian Salinity Action Plan and National Reserve System grants from Environment Australia.

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Taxonomy of the *Calytrix ecalycata* complex (Myrtaceae)

α 218 729

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Abstract

G.J. Keighery, Taxonomy of the *Calytrix ecalycata* complex (Myrtaceae). *Nuytsia* 15(2): 261–268 (2004). The part of the genus *Calytrix* Labill. that was formerly regarded as the monotypic genus *Calythropsis* C.A. Gardner is shown to be composed of two allopatric species, *Calytrix ecalycata* Craven and *C. pimeleoides* C.A. Gardner ex Keighery. The former species is comprised of three geographically separated subspecies, *C. ecalycata* subsp. *ecalycata*, *C. ecalycata* subsp. *brevis* Keighery and *C. ecalycata* subsp. *pubescens* Keighery.

Introduction

Calytrix ecalycata sens. lat. is a very distinctive member of the genus *Calytrix* Labill., having been previously placed in a separate monotypic genus, *Calythropsis* C.A. Gardner. *Calythropsis* differed from *Calytrix* in having 4- rather than 5-merous flowers and lacking a calyx. Although Craven (1987) maintained *Calythropsis* as a distinct genus, further studies led Craven (1990) to reduce it to a synonym of *Calytrix*, which necessitated the selection of a new epithet (*ecalycata*) for the species previously known as *Calythropsis aurea* C.A. Gardner. *Calytrix ecalycata* appears, as Craven (1987) noted, to be most closely related to *C. platycheiridia* Craven.

Earlier, Keighery (1979) had examined and illustrated materials grown in Kings Park which suggested that several taxa were included under *Calythropsis aurea*. This was also the opinion of Charles Gardner, who had annotated material from north of Geraldton as a separate species. Craven (1990) noted the degree of variation in his broadly circumscribed *Calytrix ecalycata*, but he felt that the variation was continuous and was unable to segregate any taxa within the complex. Subsequent examination of all collections held at the Western Australian Herbarium has lead the current author again to the conclusion that the variation is discontinuous and that several allopatric taxa are included under *Calytrix ecalycata*. This paper erects a new species based on Charles Gardner's manuscript name and describes several geographic subspecies in *Calytrix ecalycata*.

Taxonomy

Key to the species and subspecies of the *Calytrix ecalycata* complex

Because of the unique nature of the group in being 4- rather than 5-merous and lacking a calyx, the members of the of the *Calytrix ecalycata* complex separate at the beginning of any key to the genus.

1. Flowering branches with appressed imbricate ovate-obovate floral leaves ***C. pimeleoides***
1. Flowering branches with erect-spreading linear floral leaves
 2. Leaves and cheiridium pubescent ***C. ecalycata* subsp. *pubescens***
 2. Leaves and cheiridium glabrous
 3. Leaves 7–9 mm long, cheiridium resinous ***C. ecalycata* subsp. *ecalycata***
 3. Leaves 3–5 mm long, cheiridium not resinous ***C. ecalycata* subsp. *brevis***

1. *Calytrix pimeleoides* C.A. Gardner ex Keighery, *sp. nov.*

Frutex ad 1.6 m altus, glaber. Folia exstipulata, imbricata, lamina, late elliptica vel obovate, 6–7 mm longa; foliorum floralium imbricata, lamina ovata, 5–6 mm longa, 4–5 mm late. Flores cheiridio subcomplanato subteni. Hypanthium 4 costata. Stamina 35–50, 2–3 seriate. Stylus non persistens, apice hypanthii abscendens.

Typus: near Ajana, Western Australia, 19 August 1961, C.A. Gardner 13189 (*holo*: PERTH 02335255; *iso*: CANB).

Slender erect *shrub*, to 1.4 m tall and wide. *Branchlets* glabrous, brown-green not reddish, angled, apices of stems continuing growth. Bud scales absent. *Leaves* alternate, imbricate, appressed below inflorescence, stipules absent, petiole glabrous, c. 0.5 mm long, blade narrowly elliptic to obovate, 7–9 mm long, 2–3 mm wide, depressed-triangular in transverse section, with prominent scarious ciliate margins, ridged abaxially, surface slightly convex, gradually tapering to the petiole, apex acute. *Floral leaves* ovate, petiole obsolete, 5–6 mm long, 4–5 mm wide, margins scarious, ciliate-erose. *Inflorescence* 15–25 mm wide, many-flowered, usually at apex of branches; peduncles c. 0.5 mm long. *Cheiridium* flattened (more or less obovate to elliptic), glabrous, 5–6 mm long, laterally strongly ridged, lobes narrowly ovate, 1–2 mm long, margins and keel ciliate, inner entire, apex acuminate. *Hypanthium* glabrous, 4 ribbed, c. 3 mm long, not produced above the ovary, subcylindrical. *Calyx lobes* absent. *Petals* glabrous, yellow, narrowly elliptic to oblong, 9–10 mm long, c. 2 mm wide, apex rounded. *Staminal disc* prominent; stamens 35–50, 2- or 3-seriate, filaments and anthers yellow, 4–5 mm long, anthers all fertile, connective not prominent. *Style* yellow, deciduous, abscising at ovary apex, c. 5 mm long. (Figure 1A–D).

Selected specimens examined. WESTERN AUSTRALIA: S of Ogilvie, 28 Oct. 1962, J.S. Beard 2103 (PERTH); 20 km E of Kalbarri, 10 Aug. 1979, D. & B. Bellairs 1648 (PERTH); Northampton, Aug. 1947, B.J. Grieve s.n. (PERTH); 22.5 km N of Northampton, 2 June 1973, B.L. Powell 73054 (PERTH).

Distribution. Occurs inland of Kalbarri to Ajana and south to Northampton. (Figure 2A)

Habitat. On deep yellow sands, usually under *Banksia sceptrum* or *Banksia prionotes* low woodland.

Flowering period. August to October.

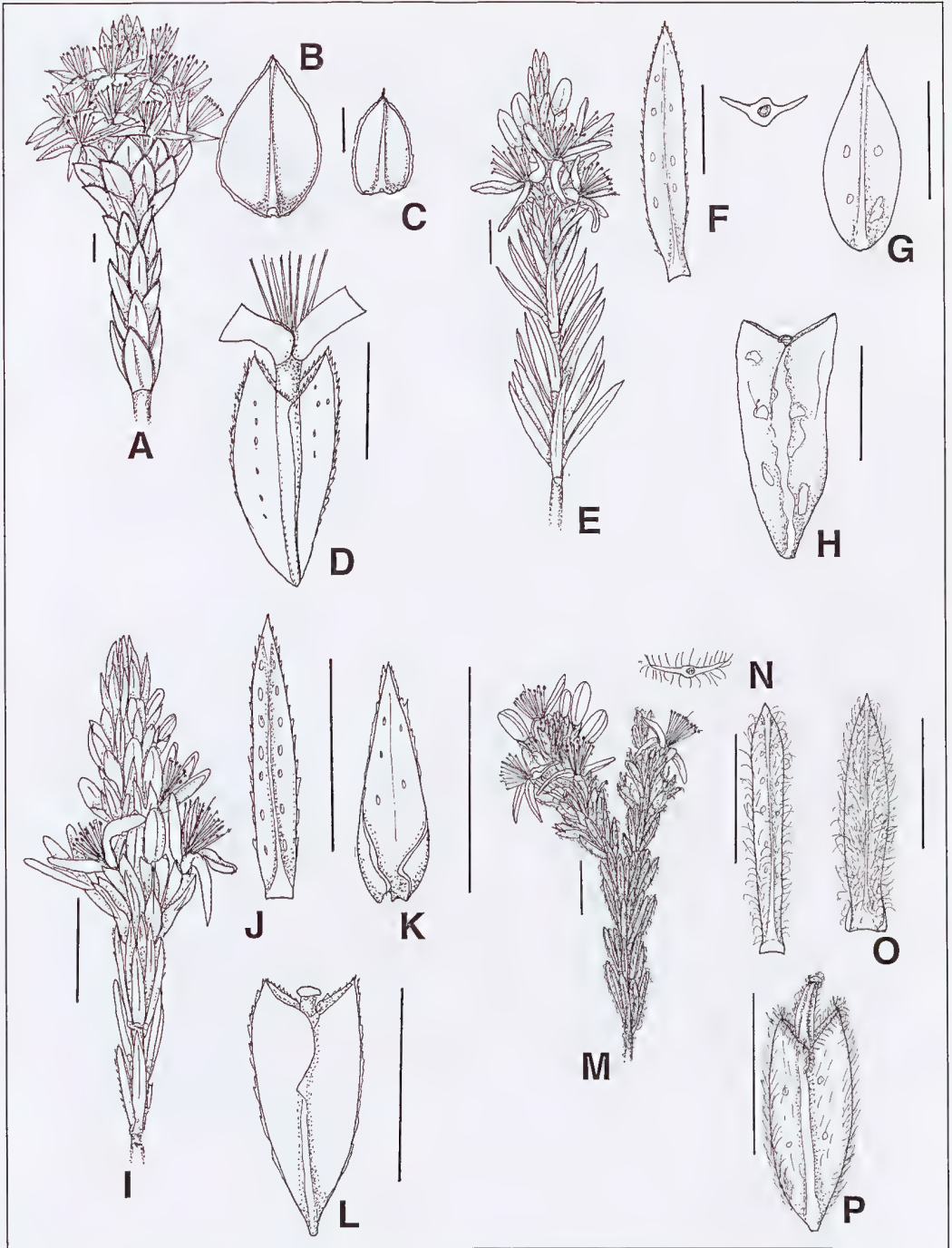


Figure 1: A–D. *Calytrix pimeleoides*. A – flowering branch, B – leaf, C – floral leaf, D – cheiridium; E–H. *Calytrix ecalycata* subsp. *ecalycata*. E – flowering branch, F – leaf with TS, G – floral leaf, H – cheiridium; I–L. *Calytrix ecalycata* subsp. *brevis*. I – flowering branch, J – leaf, K – floral leaf, L – cheiridium; M–P. *Calytrix ecalycata* subsp. *pubescens*. M – flowering branch, N – leaf, with TS, O – floral leaf, P – cheiridium. Drawn from C.A. Gardner 19 Aug. 1961 (A–D), R.J. Cranfield & P. Spencer 8095 (E–H), S. Patrick 1520 (I–L) and E.A. Griffin 5322 (M–P).

Scale bars for flowering branches = 5 mm, all other scale bars = 3 mm.

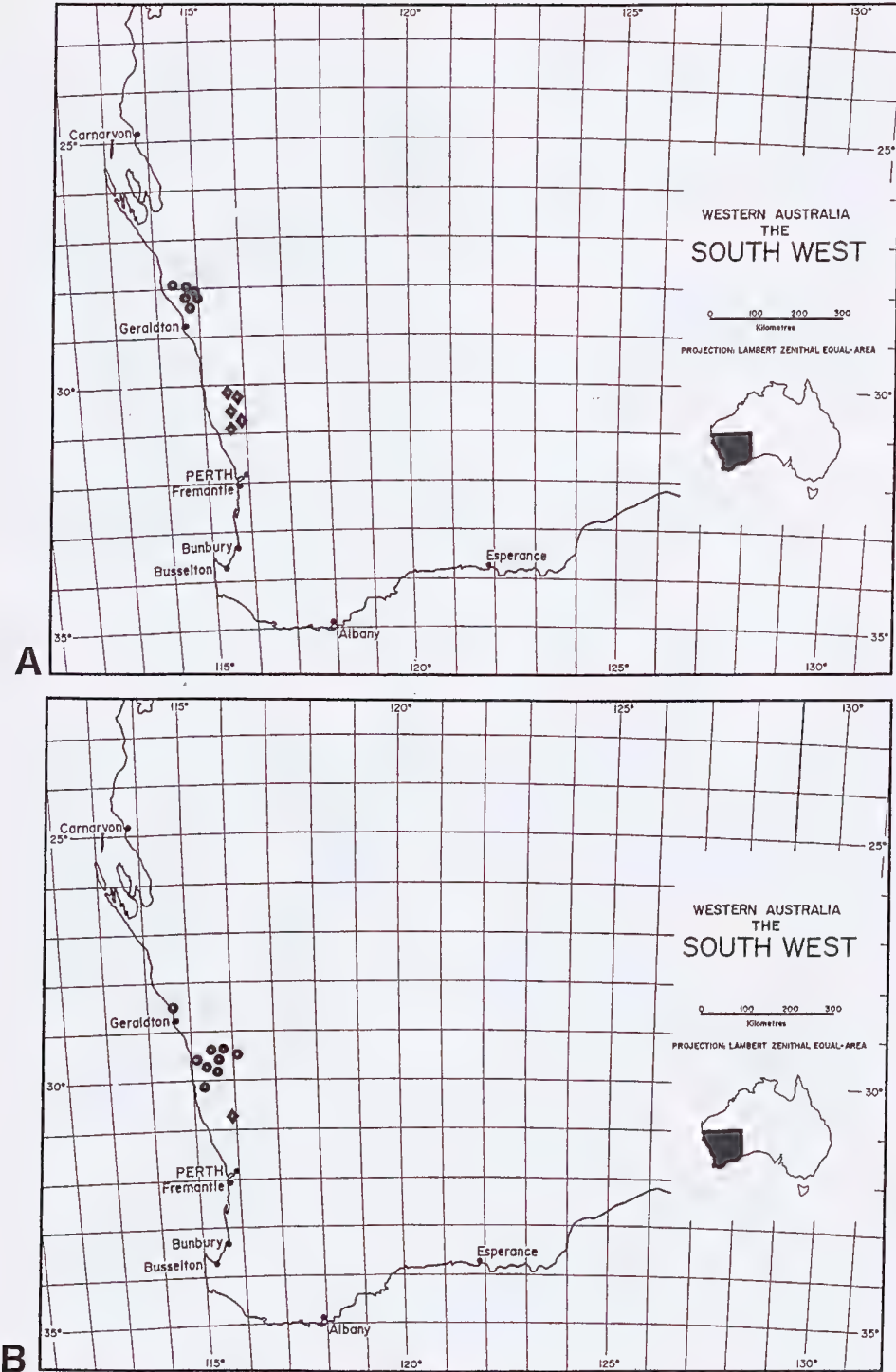


Figure 2. Distribution maps. A – *Calytrix pimeleoides* ● and *C. ecalycata* subsp. *brevis* ◆ ; B – *C. ecalycata* ● and *C. ecalycata* subsp. *pubescens* ◆ .

Chromosome number. $2n = 22$ (Rye 1979). Voucher *B.L. Powell* 73054 (PERTH 02335220).

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Present in Kalbarri National Park, but size of population uncertain.

Etymology. The epithet *pimeleoides* is a reference to the superficial appearance of the plant with the imbricate leaves of certain *Pimelea* species, such as *P. ammodharis* or *P. argentea*.

Notes. This species was annotated by Gardner as *Calytrix pimeleoides* ms on the collection chosen as the type. This is an appropriate name for the new taxon and has therefore been maintained.

It differs from *Calytrix ecalycata* in possessing large inflorescences, appressed imbricate leaves with prominent scarious margins on the glabrous flowering branches. The large ovate floral leaves and large flowers are also distinctive.

2. *Calytrix ecalycata* Craven, *Aust. Syst. Bot.* 3: 722 (1990). – *Calythropsis aurea* C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 189 (1942). *Type:* on the banks of the Arrowsmith River, Western Australia September 1940, *W.E. Blackall* 4449 (*holo:* PERTH 01628658; *iso:* CANB, PERTH 01628232, 01628240, 01628666, 01628674).

Slender erect *shrub*, to 1.6 m tall and wide, usually less. *Branchlets* glabrous, hirsute or resinous when flowering otherwise glabrous, brown-green not reddish, angled, apices of stems continuing growth. *Bud scales* absent. *Leaves* alternate, overlapping but not imbricate, erect, spreading to ascending, stipules absent, petiole glabrous or hirsute, 0.5 mm long, blade linear to narrowly elliptic, glabrous or pubescent, 3–9 mm long, 0.5–0.75 mm wide, slightly curved or straight, depressed triangular in transverse section, ridged abaxially, oil glands prominent, margins entire, ciliate or toothed, gradually tapering to the petiole, apex acute. *Floral leaves* broader, linear or elliptic-ovate, with an expanded base, glabrous or densely hairy, elliptic-ovate, usually shorter than vegetative leaves, petiole obsolete or 0.5 mm long, 3–6 mm long, 1–2 mm wide, margins scarious, ciliate or pubescent, oil glands prominent and glabrous, pubescent or covered in sticky resinous exudate, apex acute or long acute. *Inflorescence* 10–20 mm wide, axis resinous, glabrous or pubescent, many-flowered, usually at apex of branches; peduncles c. 0.5 mm long. *Cheiridium* flattened (more or less obovate to elliptic), glabrous, pubescent or resinous, shiny, 4–6 mm long, laterally strongly ridged, lobes narrowly ovate, 0.5 mm long, margins entire, apex acuminate. *Hypanthium* glabrous, 4-ribbed, fused to style, 4–6 mm long, compressed, subcylindrical, region above ovary either not or shortly produced above cheiridium. *Calyx lobes* absent. *Petals* glabrous, yellow, narrowly elliptic to oblong, 5–7 mm long, c. 2 mm wide, apex rounded. *Staminal disc* prominent; stamens 35–50, 2- or 3-seriate, filaments and anthers yellow, 4–5 mm long, anthers all fertile, connective not prominent. *Style* yellow, deciduous, abscising at ovary apex, c. 5 mm long.

Distribution. Occurs between Port Gregory and Regans Ford.

Etymology. The epithet is from the Latin words meaning without a calyx, referring to the genus *Calythropsis* lacking a calyx.

Notes. Three allopatric subspecies are recognised.

2a. *Calytrix ecalycata* Craven subsp. *ecalycata*

Slender erect *shrub*, to 1.6 m tall and wide. *Branchlets* resinous when flowering otherwise glabrous. *Leaves* erect, spreading to ascending; petiole 0.5 mm long, glabrous; blade linear, 7–9 mm long, 0.5–0.75 mm wide, glabrous, oil glands prominent, margins entire. *Floral leaves* elliptic-ovate, 4–6 mm long, c. 2 mm wide, margins scarious, ciliate, oil glands prominent, covered in sticky resinous exudate, apex long-acute. *Inflorescence* 15–20 mm wide, axis resinous. *Cheiridium* 5–6 mm long, resinous, shiny. *Hypanthium* glabrous, region above ovary short not produced above cheiridium. *Petals* 6–7 mm long. (Figure 1E–H).

Selected specimens examined. WESTERN AUSTRALIA: Yerina Springs road, 5.7 km N of Port Gregory road, 8 Aug. 1997, R. Davis 3633 (PERTH); 30 km SW of Three Springs, 4 Sept. 1984, D.B. Foreman (CANB, MEL, PERTH); 8 km N of Mt Lesueur, 24 Sep. 1979, E.A. Griffin 2224 (PERTH); Dookanooka Nature Reserve, SW of Three Springs, 5 Oct. 1992, E.A. Griffin 6914 (PERTH); Billeranga Hills, 17 km W of Morawa, 22 Apr. 1997, F. Keast 007 (PERTH).

Distribution. Occurs east of Port Gregory, then apparently disjunct to Morawa and Three Springs and west to Mt Lesueur. (Figure 2B)

Habitat. Occurs on sand (yellow, white and grey), shallow loamy soils over ironstone, sandstone and granite, sands over clays or clay-loams. In Wandoo woodland, *Melaleuca uncinata* shrubland, mixed low heath, *Eucalyptus eudesmioides* mallee. These sites are largely water gaining sites that are winter damp.

Flowering period. August to September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Relatively widespread but conservation status uncertain, although recorded as present in at least one nature reserve and probably Mt Lesueur National Park.

Notes. Differs from all other members of the *C. ecalycata* complex in the larger flowers, longer leaves, resinous floral stems, floral leaves and cheiridium. Differs from *Calytrix pimeleoides* in the linear, overlapping spreading not imbricate leaves.

2b. *Calytrix ecalycata* subsp. *brevis* Keighery, *subsp. nov.*

Folia exstipulata, non imbricata, lamina lineare, glabrescens, 3–5 mm longa, 0.75 mm late; foliorum floralium lamina lineare vel lineare-obovate, 3–4 mm longa, 1 mm late. Flores cheiridio subcomplanato, glabrescentia.

Typus: Warro Rd, 30°43'S, 115°51'E, Western Australia, S. Patrick 1545 (*holo:* PERTH 04284399; *iso:* CANB).

Slender erect *shrub*, to 1 m tall and wide. *Branchlets* glabrous. *Inflorescence* 10–15 mm wide. *Leaves* erect-ascending below inflorescence; petiole c. 0.5 mm long, glabrous; blade linear to narrowly elliptic, 3–5 mm long, 0.5–0.75 mm wide, with sparsely ciliate or toothed margins. *Floral leaves* linear with an expanded base, petiole obsolete, usually shorter than vegetative leaves, 3–4 mm long, c. 0.5 mm

wide, margins scarious, erose. *Cheiridium* glabrous, c. 4 mm long, outer margins ciliate, inner entire. *Hypanthium* glabrous, 4 ribbed, c. 3 mm long, produced above the ovary. *Petals* 5–6 mm long. (Figure 11–L).

Other specimens examined. WESTERN AUSTRALIA: between Moora and Jurien Bay, 16 Aug. 1973, T.G. Hartley 13923 (CANB, PERTH); Coorow to Greenhead road, 7.6 km W of Carger Rd, Big Soak Plain, 23 Oct. 1993, S. Patrick 1386 (PERTH); Salt River Road, 17 km N of Regans Ford, 20 Aug. 1993, S. Patrick 1520 (PERTH); in District Irwin, Oct. 1961, W. Stevens s.n. (PERTH); Wilcocks Rd, Coorow, 8 Oct. 1996, s. coll. (PERTH).

Distribution. From Coorow to west of Moora and then south to near Regans Ford. (Figure 2A)

Habitat. Occurs largely on flat yellow sandplain in Mallee shrubland or mixed shrubland.

Flowering period. From August to October.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Relatively restricted and conservation status uncertain, although recorded as present in at least one nature reserve.

Etymology. From the Latin word for short, referring to the short leaves.

Notes. Differs from other members of the complex in the glabrous stems, floral leaves and cheiridium and from *Calytrix ecalycata* subsp. *ecalycata* also in the short linear, overlapping erect but not spreading leaves.

2c. *Calytrix ecalycata* subsp. *pubescens* Keighery, *subsp. nov.*

Frutex ad 60 cm altus, pubescentia. Folia, lamina, pubescentia, lineare, 4–6 mm longa, 0.75 mm late; foliorum floralium, pubescentia, lamina lineare vel lineare-elliptica, 4–6 mm longa, 1 mm late. Flores cheiridio, pubescentia.

Typus: Barberton West Rd, south-west of Moora, 30°43'S, 115°58'E, Western Australia, 29 September 1988, E.A. Griffin 5322 (*holo:* PERTH 03118622).

Slender erect *shrub*, to 0.6 m tall and wide. *Branchlets* pubescent. *Inflorescence* 10–13 mm wide. *Leaves* spreading-ascending; blade linear, 4–6 mm long, 0.5–0.75 mm wide, covered with long white hairs, giving the plant a greyish colour, margin entire. *Floral leaves* broader with an expanded base, 4–6 mm long, c. 1 mm wide, more densely hairy. *Cheiridium* margins pubescent, rest covered in scattered hairs. *Hypanthium* not produced above the ovary. *Petals* 5–6 mm long.

Other specimens examined. WESTERN AUSTRALIA: C.A. Gardner? 12766 (PERTH 04134702, 05073545).

Distribution. Known only from type locality. (Figure 2B).

Habitat. On brown loamy clay in *Eucalyptus wandoo* woodland.

Flowering period. Recorded in flower in September.

Conservation status. Conservation Codes for Western Australian Flora: Priority One.

Etymology. The epithet is from the Latin word for hairy.

Notes. Differs from other members of the complex in the non-glandular pubescent stems, floral leaves and cheiridium, and from *Calytrix ecalycata* subsp. *ecalycata* also in the short linear, erect but not spreading leaves and the smaller flowers.

This is the southernmost member of the complex, which has been represented in PERTH for many years by an unlabelled collection, perhaps collected by Charles Gardner.

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Two new species of *Dampiera* (Goodeniaceae) from the Pilbara region, Western Australia

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Abstract

B.J. Lepschi, M.E. Trudgen and S.J. van Leeuwen. Two new species of *Dampiera* (Goodeniaceae) from the Pilbara region, Western Australia. *Nuytsia* 15(2): 269–276 (2004). *Dampiera anonyma* and *Dampiera metallorum* Lepschi & Trudgen, two geographically restricted taxa from the Pilbara region of Western Australia, are described, illustrated and their distributions mapped.

Introduction

Dampiera R.Br. is an endemic Australian genus of the Goodeniaceae well represented in Western Australia, with 58 of the 66 described species so far recorded from the State (Paczkowska & Chapman 2000), the majority of which are endemic to the South-west Botanical Province. Four species, *D. atriplicina* C. Gardner ex Rajput & Carolin, *D. candicans* F. Muell., *D. cinerea* Ewart & O.B. Davies and *D. dentata* Rajput are recorded as occurring in the Pilbara region of the Eremaean Botanical Province (Paczkowska & Chapman 2000). None of the four recorded species are endemic to the Pilbara region, and extend further south, east, and (in the case of *D. candicans*), north into the Eremaean and Northern Botanical Provinces of the State.

The presence of two additional *Dampiera* species in the Pilbara region was recognised by one of the authors (MET) in the mid 1970s, but lack of suitable collections precluded formal recognition of these entities, known informally as *Dampiera* sp. Mt Bruce (M.E. Trudgen 1334) and *Dampiera* sp. Mt Meharry (M.E. Trudgen 1178). Since the 1970s, further collections of both taxa have been made, and a better understanding of their ecological preferences and distribution has also been gained, especially through recent fieldwork by SVL. Our research suggests that both entities represent distinct species, both of which are endemic to the Pilbara region, and both occupying geographically and ecologically restricted ranges.

In this paper we present descriptions of these two new species of *Dampiera*, along with notes on their distribution, ecological preferences and relationships. Amendments to the most recent key to *Dampiera* species in Australia (Rajput & Carolin 1992) are also presented, to aid the identification of these two new species.

Materials and methods

This study is based on examination of herbarium collections from KARR. (the Department of Conservation's regional herbarium situated in Karratha, Western Australia) and PERTH. All measurements were made from herbarium material (reconstituted where necessary). See the end of this issue for definitions of conservation codes used in this paper. Terminology for corolla hair types follow Rajput & Carolin (1992).

New species descriptions

Both species described here appear to belong to Sect. *Dampiera* Subsect. *Dampiera*, following the classification of Rajput & Carolin (1992), on the basis of stem and inflorescence morphology and growth habit. Phyllotaxy of the new species has not been investigated, but it could be expected to be 2/5, as has been reported for other taxa in Subsect. *Dampiera* (Rajput & Carolin 1992).

1. *Dampiera anonyma* Lepschi & Trudgen, *sp. nov.*

Ad *D. incanam* R.Br. similis sed illa specie fructo et ovulo stricto nunquam curvato differt.

Typus: Summit of Mt Nameless, Western Australia, 14 September 1991, Peter G. Wilson & R. Rowe 1088 (*holo*: PERTH 04003934; *iso*: BRI, DNA, NSW all *n.v.*)

Illustration. Rajput & Carolin, Fl. Australia 35: 52 (1992) [as *D. incana* var. *fuscescens*]

Multistemmed *perennial* 0.3–0.5 (–1) m, diffuse to straggling, less often compact and rounded. *Stems* angular-terete, becoming more or less terete with age, longitudinally ridged, with dense, spreading, whitish dendritic hairs, c. 0.1–1.1 mm long (hairs in leaf axils are longer, to 1.8 mm). *Leaves* alternate, obscurely petiolate to sessile; petiole 0–2 mm long; lamina obovate to narrowly obovate, narrowly to broadly elliptic or obovate-elliptic (sometimes narrowly so), rarely sub-falcate, becoming progressively reduced towards and within the inflorescence, 4–27.5 mm long, 1–16.5 mm wide; base attenuate to narrowly cuneate or parallel; apex acute to apiculate or rounded; margin entire or occasionally with 1 (–3) blunt teeth in the distal portion; hairy with dense, spreading, whitish dendritic hairs, c. 0.1–1.5 mm long, uppermost leaves (especially in the inflorescence) frequently glabrescent adaxially; senescent leaves may also be patchily glabrescent. *Inflorescence* a cymo-panicle, inflorescence branches solitary in leaf axils, 1–4 –flowered; branches and pedicels hairy with dense, spreading, whitish dendritic hairs, c. 0.2–1 mm long. *Pedicels* 0.5–5.2 mm long, ebracteolate. *Sepals* obscured by indumentum, broadly-ovate to rounded triangular, 0.2–0.3 mm long. *Corolla* blue to light-blue, bluish-purple or purple with yellow throat, 7–8 mm long, hairy abaxially with dense, spreading, whitish to grey type i dendritic hairs, c. 0.3–1.5 mm long; abaxial lobes narrowly obovate to very-narrowly elliptic or (for lateral lobes) sub-falcate, 3–3.5 mm long, 0.5–1.1 mm wide; connate part of abaxial lobes 3–5 mm long; wing 0.8–2.1 mm wide; adaxial lobes more or less falcate to narrowly elliptic, with a marginal bulge on the upper side (adjacent the auricle), 5.4–6 mm long, 1.2–1.9 mm wide; auricle maroon to purplish (when dry), 1.6–2.1 mm long, 1–1.1 mm wide; wing 0.7–1.4 mm wide (narrowest above auricle); calli absent. *Ovary* more or less cylindrical, straight, hairy with dense, spreading, whitish to grey type i dendritic hairs, c. 0.4–1 mm long, unilocular, 1.6–2.5 mm long; ovule 1, basifixed, straight, very-narrowly oblong to very-narrowly oblong-elliptic, 1–1.4 mm long; style (including indusium) 3.1–4.3 mm long, maroon to purplish (when dry), glabrous; indusium 0.8–1.1 mm wide. *Fruit* more or less

cylindrical, straight, longitudinally ridged to coarsely 'wrinkled' (these features obscured by the indumentum), 2.5–3.5 mm long, hairy (indumentum as on ovary), eventually glabrescent. (Figure 1 A, B).

Selected specimens examined. WESTERN AUSTRALIA: Top of Mt Nameless, 31 July 1980, K.J. Atkins & P. Wurm HI 779 (KARR., PERTH); summit of Mt Bruce, 19 Aug. 1963, J.S. Beard 2916 (PERTH); summit of Mt Sheila, 10 km NW of Hamersley Station Homestead, 7.5 km NNE of Mt McRae, Hamersley Range, 7 Aug. 1991, M. Hughes s.n. (KARR., PERTH); flat area near top of Mt Bruce (north side), Hamersley Range National Park, 23 June 1975, M.E. Trudgen 1334 (MEL, NSW, PERTH); Karijini National Park, Hamersley Range, Mt Hyogo, 8.2 km S of Marandoo Hill, 24 Aug. 1995, S. van Leeuwen 2057 (KARR., PERTH); Mt Bennett, 33.3 km WSW of Mt Barricade, Karijini National Park, Hamersley Range, 23 Aug. 1995, S. van Leeuwen 2070 (CANB, KARR., PERTH); Hamersley Range, 4.6 km SW of summit of Mt Truchanas, 10 Sep. 1996, S. van Leeuwen 2692 (KARR., PERTH); Mt Hyogo, 13.8 km SSE of Mt Bruce, Karijini National Park, Hamersley Range, 30 July 1998, S. van Leeuwen 3517 (AD, BRI, CANB, KARR., MEL, NSW, PERTH); 7.3 km NW of Mt Frederick, Hamersley Range, 6 Aug. 1998, S. van Leeuwen 3657 (CANB, K, KARR., PERTH); Mt Stevenson, 10.7 km S of Mt Frederick, Karijini National Park, Hamersley Range, 7 Aug. 1998, S. van Leeuwen 3696 (BRI, CANB, KARR., PERTH); Mt Bennett, 27.5 km ESE of Mt Truchanas, Karijini National Park, Hamersley Range, 7 Aug. 1998, S. van Leeuwen 3741 (CANB, KARR., PERTH, US); Mt Sheila, 7.6 km NNE of Mt McRae, Hamersley Range, 17 Aug. 1998, S. van Leeuwen 3781 (CANB, KARR., PERTH); summit ridge of Mt Bruce (at E end), Hamersley Range National Park, 17 Aug. 1974, J.H. Willis s.n. (MEL n.v., PERTH)

Distribution. Restricted to the western central Hamersley Range in the southern Pilbara region of Western Australia. (Figure 2).

Habitat. Grows on hill summits or upper slopes (above 1000 m), in skeletal, red-brown to brown gravelly soil, usually over massive banded ironstone of the Brockman Iron Formation, but also recorded from meta-basalt (Mt Bennett), shale and jaspilite (Mt Hyogo and Mt Hyogo West). On banded ironstone sites, vegetation is typically comprised of *Eucalyptus kingsmillii* and *E. gamophylla* shrub mallee (with emergent scattered *E. leucophloia*) over a diverse shrub and hummock grass (*Triodia* spp.) layer. On other substrates the eucalypts are replaced by *Brachychiton acuminatus* and *B. gregorii*.

Phenology. Flowers and fruits recorded during June to September.

Conservation status. Conservation Codes for the Western Australian Flora: Priority 3. It is recommended that the conservation status of this taxon be downgraded to Priority 4, as existing populations are not currently endangered and recent botanical survey work (by SVL) indicates that the taxon is more widespread than previously thought. Seven of the eleven known populations are afforded protection within Karijini National Park.

Etymology. From the Greek, *an* (without) and *onyma* (a name), in reference to the type locality (Mt Nameless). The epithet also highlights the fact that this species languished without a name for over 25 years, despite its recognition as a distinct taxon (by MET) in 1975.

Affinities. *Dampiera anonyma* is probably most closely related to *D. incana* R.Br., which it resembles in gross morphology, and collectors have generally referred material of *D. anonyma* to this species. Carolin & Rajput (1992) also included material of *D. anonyma* (Trudgen 1334 and Willis s.n., 17 Aug. 1974) in their concepts of *D. incana* var. *fuscescens* Benth. and var. *incana* respectively. However,

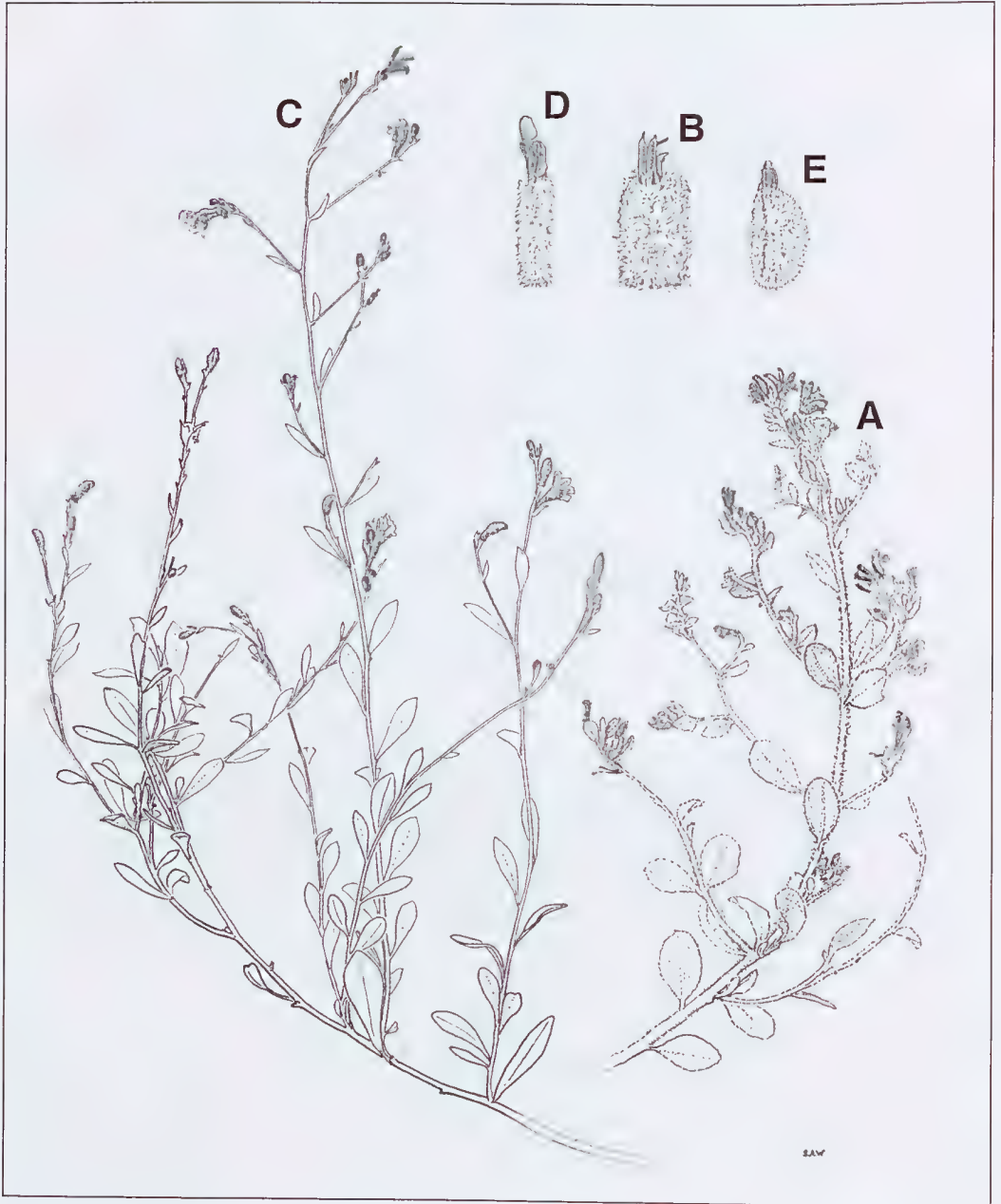


Figure 1. A-B. *Dampiera anonyma*. A – flowering branchlet, B – fruit (with floral remnants); C-D. *Dampiera metallorum*. C – flowering branchlet, D – fruit (with floral remnants); E. *Dampiera incana* fruit (with floral remnants). Drawn from S.J. van Leeuwen 3791 (A), S.J. van Leeuwen 3657 (B), J.N. Dunlop s.n. (PERTH 1714813) (C), S.J. van Leeuwen 4166 (D) and A.S. George 2580 (E).

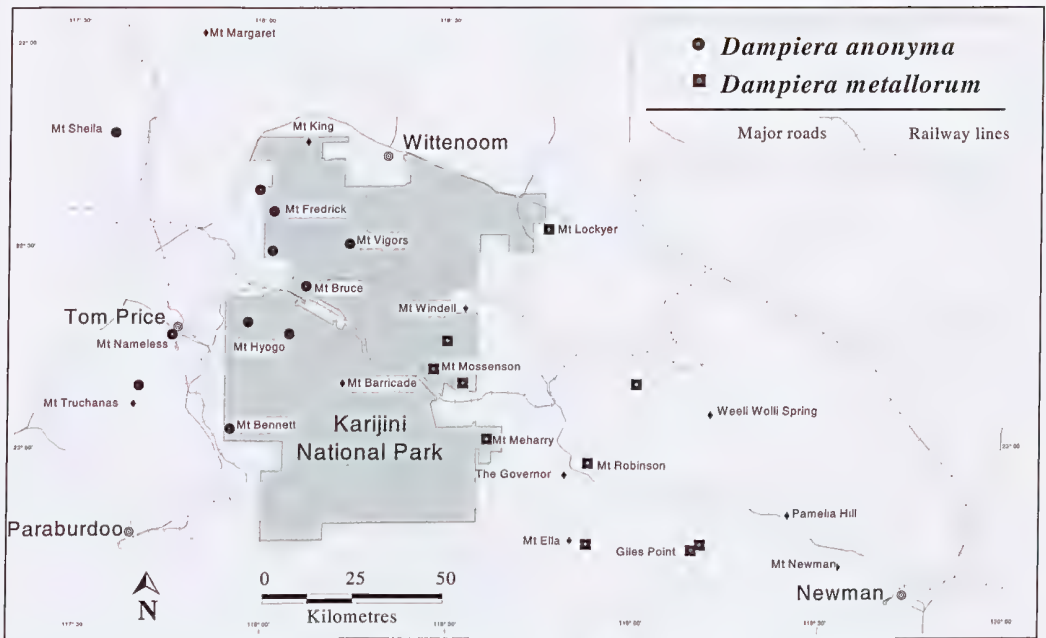


Figure 2. Distribution of *Dampiera anonyma* (●) and *D. metallorum* (■).

D. incana differs from *D. anonyma* in its curved (oblique), rather than straight, fruit and ovule (see Figure 1E), the more closely appressed and less 'loose' indumentum on the vegetative parts, and also leaf shape. In *D. incana* leaves tend to be narrowly-obovate to obovate, as opposed to the frequently broadly-elliptic to obovate or obovate-elliptic leaves of *D. anonyma*. The two species also have different ecological preferences, with *D. incana* occurring on sandy, frequently calcareous soils at low altitudes in coastal or near-coastal districts, and *D. anonyma* restricted to skeletal soils on banded ironstone formations above 1000m in the Pilbara region.

Dampiera anonyma also superficially resembles *D. tomentosa*, and early collections of *D. anonyma* have been referred to that taxon. However, *D. tomentosa* may readily be separated from *D. anonyma* by the long, silky indumentum on the corolla, comprising both type i and type ii hairs (to 3 mm long), and the frequently larger flowers (to 15 mm long).

Notes. This species has been referred to by the phrase name *Dampiera* sp. Mt Bruce (M.E. Trudgen 1334) *in herb.* at PERTH. Little is known of the biology of this species, although European honeybees (*Apis mellifera* L.) have been observed working inflorescences of *D. anonyma* (SVL pers. obs.).

2. *Dampiera metallorum* Lepschi & Trudgen, *sp. nov.*

Ad *D. incanam* R.Br. similis, sed illa specie fructo et ovulo stricto nunquam curvato, corolla plerumque indumento atratiore, et partibus vegetativis glabrescentibus magis celeriter, differt. Etiam ad *Dampiera roycei* Rajput foliis concoloris, et vegetativis partibus glabrescentibus magis celeriter, differt.

Typus: Mt Meharry, 350 m W of summit, 33.4 km WSW of Packsaddle Hill, Karijini National Park, Hamersley Range, Western Australia, 18 Sep. 1998, *S. van Leeuwen* 4033 (*holo*: PERTH 06232256; *iso*: AD, BRI, CANB, K, KARR., MEL, NSW, US).

Rounded, multistemmed *perennial* 0.3–0.5 m; vegetative parts with appressed whitish dendritic hairs, *c.* 0.05–0.15 mm long, dense when young, becoming glabrescent with age (hairs in leaf axils are longer (to 0.7 mm) and frequently spreading). *Stems* angular-terete, becoming more or less terete with age, longitudinally ridged. *Leaves* alternate, obscurely petiolate to sessile; petiole 0–3 mm long; lamina narrowly obovate to obovate or very-narrowly obovate to very-narrowly elliptic or very-narrowly triangular, becoming progressively reduced towards and within the inflorescence, 1.5–55 mm long, 0.3–11 mm wide; base attenuate to narrowly cuneate or parallel; apex acute to narrowly acute, apiculate or rounded; margin entire or occasionally with 1 (–2) blunt teeth in the distal portion. *Inflorescence* a cymopanicule, inflorescence branches solitary in leaf axils, 1–3 –flowered; branches and pedicels with appressed to spreading, whitish to grey dendritic hairs, *c.* 0.1–0.4 mm long, dense when young, becoming glabrescent with age. *Pedicels* 1.5–7.5 mm long, ebracteolate. *Sepals* obscured by indumentum, broadly ovate to rounded-triangular, 0.1–0.2 mm long. *Corolla* blue with yellow throat, 7–10 mm long, hairy abaxially with dense, spreading, grey to dark grey type i dendritic hairs, *c.* 0.1–0.8 mm long; abaxial lobes narrowly elliptic to sub-falcate (for lateral lobes), 3.5–4.8 mm long, 0.9–1 mm wide; connate part of abaxial lobes 3 mm long; wing 0.8–1.4 mm wide; adaxial lobes more or less falcate, with a marginal bulge on the upper side (adjacent the auricle), 4.5–4.8 mm long, 1.5–1.8 mm wide; auricle maroon to purplish (when dry), 1.5–1.6 mm long, 1–1.2 mm wide; wing 0.5–1.3 mm wide (narrowest above auricle); calli absent. *Ovary* more or less cylindrical to obovoid, straight, hairy with dense, spreading, grey to dark grey type i dendritic hairs, *c.* 0.1–0.8 mm long, unilocular, 2 mm long; ovule 1, basifixed, straight, very-narrowly oblong to very-narrowly oblong-elliptic, 0.9–1.2 mm long; style (including indusium) 3.3–3.8 mm long, maroon to purplish (when dry), glabrous; indusium 0.6–0.8 mm wide. *Fruit* more or less cylindrical, straight, longitudinally ridged, 2.5–3 mm long, hairy (indumentum as on ovary), becoming glabrescent with age. (Figure 1C–D).

Selected specimens examined. WESTERN AUSTRALIA: West Angelas, June 1984, *J.N. Dunlop* JT312 (PERTH); An unnamed gorge in the Hamersley Range, 29 Sept. 1974, *M.E. Trudgen* 1178 (MEL, NSW, PERTH); Karijini National Park, Hamersley Range, 9.3 km W of Wildflower Mountain, 23 Aug. 1995, *S. van Leeuwen* 2005 (CANB, KARR., PERTH); Mt Robinson, Hamersley Range, 6.3 km NE of The Governor, 19 April 1997, *S. van Leeuwen* 3141 (KARR., PERTH); Mt Mossenson, 23.3 km NNW of Mt Meharry, Karijini National Park, Hamersley Range, 29 July 1998, *S. van Leeuwen* 3490 (CANB, KARR., PERTH); 25.6 km NNE of Mt Robinson, Hamersley Range, 28 Sept. 1998, *S. van Leeuwen* 4059 (AD, BRI, CANB, K, KARR., PERTH); Mt Robinson, 6.5 km NE of the Governor, Hamersley Range, 29 Sept. 1998, *S. van Leeuwen* 4108 (CANB, KARR., PERTH); 4.7 km E of Mt Ella, Hamersley Range, 30 Sept. 1998, *S. van Leeuwen* 4166 (CANB, KARR., PERTH); Giles Point, 28 km WSW of Pamela Hill, Ophthalmia Range, 2 Oct. 1998, *S. van Leeuwen* 4261 (CANB, KARR., PERTH); 2.9 km NE of Giles Point, Ophthalmia Range, 2 Oct. 1998, *S. van Leeuwen* 4269 (CANB, KARR., PERTH)

Distribution. Restricted to the eastern central Hamersley Range and the adjacent Ophthalmia Range in the southern Pilbara region of Western Australia. (Figure 2).

Habitat. Grows on hill summits or upper slopes (above 1000 m), in skeletal, red-brown gravelly soil over massive banded ironstone of the Brockman Iron Formation. Vegetation typically comprises *Eucalyptus kingsmillii*, *E. ewartiana* and *E. gamophylla* shrub mallee over a diverse shrub and

hummock grass (*Triodia* spp.) layer.

Phenology. Flowers and fruits recorded during April and June to October.

Conservation status. Conservation Codes for the Western Australian Flora: Priority 3. As with *D. anonyma*, it is recommended that the conservation status of this taxon be downgraded to Priority 4, as existing populations are not currently endangered and recent botanical survey work (by SVL) indicates that the taxon is more widespread than previously thought. Four of the ten known populations are protected within Karijini National Park.

Etymology. From the Latin, *metallum* (mine, ore, mineral), in reference to the occurrence of this species on highly mineralised, ore-rich substrates in an active mining province.

Affinities. *Dampiera metallorum* appears to be allied to *D. incana* and *D. roycei*, with which it shares similar vegetative and floral morphology. *Dampiera incana* may be distinguished from *D. metallorum* by the denser, more persistent indumentum on the vegetative parts, generally paler corolla hairs, and the curved (oblique) fruit and ovule (see Figure 1E). *Dampiera roycei* differs from *D. metallorum* in the more persistent indumentum on the vegetative parts, entire, frequently discoloured leaves (the abaxial surface is glabrescent) and the presence of both type i and type ii hairs on the corolla. *Dampiera incana* and *D. roycei* also exhibit different ecological preferences to *D. metallorum*. *Dampiera incana* grows on sandy, frequently calcareous soils at low altitudes in coastal or near-coastal districts, while *D. roycei* grows in sandy (or less often loamy or clayey) soils at similarly low altitudes in arid areas. *Dampiera incana*, *D. roycei* and *D. metallorum* also all occupy geographically distinct ranges.

Notes. First recognised as a distinct taxon by MET in 1975, this species has been referred to by the phrase name *Dampiera* sp. Mt Meharry (M.E. Trudgen 1178) *in herb.* at PERTH. As with *D. anonyma*, little is known about the biology of *D. metallorum*. However, observations by SVL indicate that *D. metallorum* is a vigorous basal resprouter, regenerating from basal adventitious buds after burning. Plants have been recorded flowering less than 12 months after fire.

Amendments to “Flora of Australia” key

In the treatment of *Dampiera* in the *Flora of Australia* (Rajput & Carolin 1992), *D. metallorum* will key to either Group 6 or Group 8 in the ‘Key to artificial groups’, depending on the material available, and *D. anonyma* keys to Group 8 in the ‘Key to artificial groups’.

For the taxa in Group 6, the key to species requires alteration to accommodate *D. metallorum*. Couplets 7 to 9 should then be replaced with the following:

- 7. Corolla 7–10 mm long
 - 8. Leaf margins revolute. Arid southern W.A. **D. eriantha**
 - 8: Leaf margins flat, not revolute. Pilbara region of W.A. or eastern Qld & N.S.W.
 - 9. Corolla with type ii hairs. Eastern Qld and N.S.W. **D. adpressa**
 - 9: Corolla with type i hairs. Pilbara region, W.A. **D. metallorum**
- 7: Corolla 13–20 mm long
 - 10. Corolla hairs slate grey, closely tomentose **D. juncea**
 - 10: Corolla hairs silvery grey, loosely tomentose **D. oligophylla**

The following revised key to Rajput & Carolin's (1992) Group 8 will allow recognition of both *D. anonyma* and *D. metallorum*.

- 1. Corolla yellow **D. luteiflora**
- 1: Corolla blue or purple
 - 2. Corolla hairs appressed **D. orchardii**
 - 2: Corolla hairs not appressed
 - 3. Lower leaf surface clearly visible beneath hairs
 - 4. Corolla with type i and/or type ii hairs. Low altitudes in W.A. and N.T.
 - 5. Corolla with type i and ii hairs; arid W.A. and adjacent N.T. **D. roycei**
 - 5: Corolla with type ii hairs only; south-western W.A. **D. haematotricha**
 - 4: Corolla with type i hairs only. High altitudes (>1000 m) in the Pilbara region, W.A. **D. metallorum**
 - 3: Lower leaf surface completely hidden beneath dense hairs
 - 6. Corolla hairs long, silky, branched mostly near base **D. tomentosa**
 - 6: Corolla hairs short, not silky, branched along their length
 - 7. Upper leaf surface glabrescent, leaves frequently discolourous; corolla with type i and type ii hairs **D. roycei**
 - 7: Upper leaf surface with persistent indumentum, leaves concolourous; corolla with type i hairs only
 - 8. Fruit and ovule curved. Coast and adjacent areas at low altitudes, W.A. **D. incana**
 - 8: Fruit and ovule straight. High altitudes (>1000 m) in the Pilbara region, W.A. **D. anonyma**

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**A review of *Hibbertia hemignosta* and its allies (Dilleniaceae)
from Western Australia**

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Abstract

Wheeler, J.R. A review of *Hibbertia hemignosta* and its allies (Dilleniaceae) from Western Australia. *Nuytsia* 15(2): 277–298 (2004). The group of species that includes *Hibbertia hemignosta* (Steud.) J.R. Wheeler is reviewed and a key provided. The new species *Hibbertia acrotrichion* J.R. Wheeler and *Hibbertia chartacea* are described. Two new varieties of *Hibbertia hibbertioides* (Steud.) J.R. Wheeler, var. *meridionalis* and var. *pedunculata*, and two new varieties of *Hibbertia pulchra* Ostenf., var. *acutibractea* and var. *crassinervia*, are also described. All taxa are mapped and illustrated. Both new species have conservation priority, but the four new varieties are not considered endangered.

Introduction

This is the fifth paper in a series (Wheeler 2002a–d) revising small species groups within section *Candollea* Gilg of the genus *Hibbertia* Andr. and deals with the *Hibbertia hemignosta* group, which here comprises eleven taxa including two new species and four new varieties. This paper continues from nomenclatural studies on *Hibbertia enervia* (Toelken & Wheeler 2002), in which new combinations were made for both *H. hemignosta* and *H. hibbertioides*.

Bentham (1863) took a broad view of species in this group and combined the taxa, here recognised as *Hibbertia hemignosta* and *Hibbertia hibbertioides*, under the name *Candollea teretifolia* Turcz. Hoogland (1974) took a similar broad view and combined the same taxa under *Hibbertia enervia* (DC.) Hoogl. Ostenfeld (1921) observed that more than one taxon was involved but did not have access to the Preiss material seen by Steudel. Recent study with more material has helped to clarify the differences between the species and infraspecific taxa that belong in the *H. hemignosta* group.

The biogeographic regions listed for the distributions of the taxa follow Thackway & Cresswell (1995).

Taxonomy

Key to taxa of the *Hibbertia hemignosta* group

1. Sepals, particularly outermost, with a prominent although sometimes very small caudate tip (0.2)0.5–2.5 mm long
2. Leaves linear, terete to flattened, more or less straight, smooth or appearing 2-grooved below due to the tightly revolute margins, apex occasionally slightly recurved
3. Leaves terete to semiterete or triangular in section, rarely almost flat, smooth below
 4. Flowers sessile or subsessile *H. hibbertioides* var. *hibbertioides*
 4. Flowers distinctly pedunculate *H. hibbertioides* var. *pedunculata*
3. Leaves flattened with revolute margins appearing distinctly 2-grooved below, from near the base to apex *H. rupicola*
2. Leaves extremely narrowly obtriangular and shallowly sigmoid, lower surface only appearing very shallowly grooved due to somewhat revolute margins, apex distinctly recurved *H. hamata*
1. Sepals acute to obtuse, sometimes with a minute apical point less than 0.5 mm long
5. Stamens 2.5–3.5(4) mm long. Anthers 1.2–1.9 mm long, oblong to elliptic, slightly tapered upwards to a subacute or apiculate apex. Leaves terete to flat
6. Bracts conspicuous, 2–3.5 mm wide. Sepals chartaceous, obtuse to emarginate
 7. Leaves terete to semi-terete, apices with a few minute hairs *H. acrotrichion*
 7. Leaves flat, glabrous *H. chartacea*
6. Bracts inconspicuous, up to 1.5 mm wide. Sepals herbaceous, acute to obtuse
8. Leaves (3)4–10(12) mm long. Staminal filaments of fascicles fused for c. two-thirds of their length *H. hemignosta*
8. Leaves 10–22 mm long. Stamens of fascicles fused for up to half their length *H. hibbertioides* var. *meridionalis*
5. Stamens 1.5–2.5 mm long. Anthers 0.8–1.5 mm long, oblong to obovate, the apex obtuse to truncate and often slightly dilated after anthesis. Leaves somewhat flattened to flat, sometimes midrib thickened, rarely semi-terete
9. Bracts conspicuous, 1.5–3 mm long. Leaves flat or with a narrow raised midrib, rarely semi-terete and midrib not evident
10. Bracts circular to depressed ovate, 2–3 mm wide *H. pulchra* var. *pulchra*
10. Bracts ovate to elliptic, 1–1.3 mm wide *H. pulchra* var. *acutibractea*
9. Bracts inconspicuous, 0.5–1.5 mm long. Leaves flat, with broad raised midrib *H. pulchra* var. *crassinervia*

1. *Hibbertia acrotrichion* J.R. Wheeler, *sp. nov.*

Hibbertiae hemignostae affinis sed sepalis chartaceis latoribus, obtusis vel emarginatis; bracteis latoribus magis chartaceis ad apicem pilis crispatis instructis differt.

Typus: Fitzgerald River National Park, Collets Rd, 2.3 km east of junction with West Mt Barren track, 34°10'S, 119°26'E, Western Australia, 7 September 2001, *J.R. Wheeler* 4090 (*holo:* PERTH 06458173; *iso:* AD, CANB, K, MEL, NSW).

Shrub to 0.3 m high; branchlets glabrescent, with appressed curled hairs on new growth. *Leaves* spirally arranged, mostly clustered on short axillary shoots, sessile, linear, terete to semi-terete, straight to slightly curved, 4–7 mm long, 0.5–0.7 mm wide, glabrous apart from a small tuft of curled hairs at the apex. *Flowers* solitary, terminal or terminating short shoots, sessile, 10–14 mm diam.; *bracts* 1–3 below the flower, dark brown or red-brown, very broadly ovate to circular, 1–3 mm long, 2–3 mm wide, somewhat chartaceous and easily torn, glabrous or almost so, the outermost with a prominent apiculum and dark midline and usually with a few curled hairs towards the apex, the innermost obtuse with a minute point. *Sepals* 5, dark and somewhat chartaceous, very broadly elliptic, obtuse to slightly emarginate; outer sepals 3.5–4.5 mm long, 4–5 mm wide; inner sepals 4–6 mm long, 4–5 mm wide. *Petals* 5, yellow, obovate, 6–7 mm long, emarginate. *Stamens* 11, 9 of them grouped into 3 fascicles each of 3 stamens and 2 single stamens, 2.5–3.5 mm long; filament 1–1.5 mm long, distinctly fused in the fascicles for approximately two-thirds of their length; anther oblong to elliptic, 1.2–1.8 mm long, obtuse to subacute. *Carpels* 3, obovoid, 1–1.2 mm long, 0.5–0.8 mm wide, glabrous; style erect, c. 2 mm long; ovule 1 per carpel. *Fruiting carpels* ellipsoid, c. 2.5 mm long and 1.5 mm wide. (Figure 1).

Other specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: Bremer Bay, 12 Sep. 1971, *S. Paust* 570; Bremer Bay, 1901, *J. Wellstead s.n.*; c. 2 km W of track to West Mt Barren, Fitzgerald River National Park, 23 Sep. 1986, *J.R. Wheeler* 2440 (duplicate CANB); Boxwood Hill, Paperbark Rd, property of Rex Parsons, near the Pallinup River Reserve, 3 Aug. 2000, *J.R. Wheeler* 4046 (duplicate AD); Fitzgerald River National Park, Collets Rd, c. 2 km W of junction with West Mt Barren track, 7 Sep. 2001, *J.R. Wheeler* 4084 (duplicate MEL); Fitzgerald River National Park, Collets Rd, c. 2 km W of junction with West Mt Barren track, 7 Sep. 2001, *J.R. Wheeler* 4085 (duplicates AD, K, DUKE); Plateau N of Hamersley River, 5 miles [8 km] from Phillips River Crossing, 28 Aug. 1965, *E. Wittwer* 436.

Distribution. Western Australia, South West Botanical Province, IBRA region of Esperance Plains. Restricted to the south coast between Bremer Bay and Ravensthorpe. (Figure 2).

Habitat. Recorded from sandy soils in heath or mallee heath.

Phenology. Flowers recorded August and September. Only a single fruiting carpel seen (*J. Wellstead s.n.*) with no exact date of collection.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. Apparently restricted in distribution being known from very few populations but is recorded from a National Park.

Etymology. From the Greek *acros* – at the tip and *trichion* – small hair, referring to the presence of small curled hairs towards the apex of an otherwise glabrous leaf.

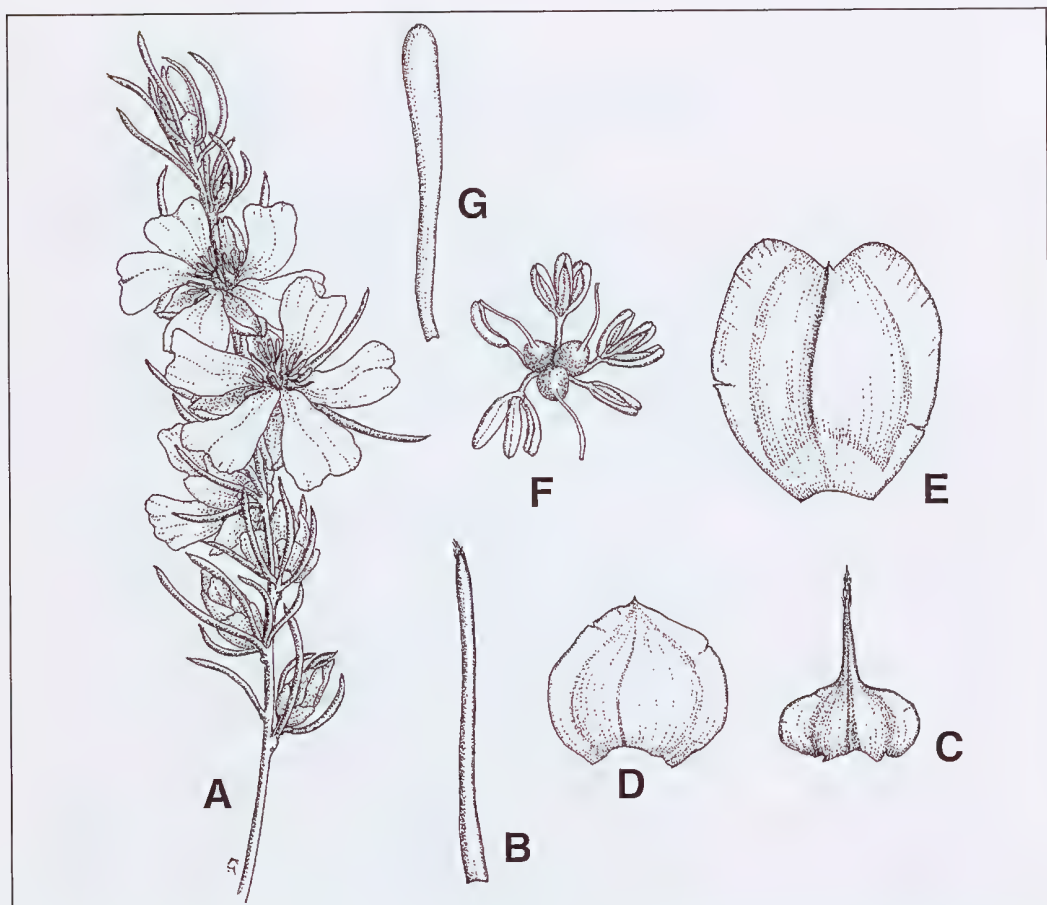


Figure 1. A–F. *Hibbertia acrotrichion*. A –flowering branch (x2), B – leaf (x4), C – outer bract (x8), D – inner bract (x8), E – sepal (x8), F – stamens and carpels (x8); G – *Hibbertia chartacea*, leaf (x8). Drawn from J.R. Wheeler 4090 (A–F) and A. Strid 20314 (G).

Affinities. Similar to *Hibbertia hemignosta* but quite distinct in its prominent broad bracts, larger and obtuse to emarginate sepals which are thinner and easily torn. Also differs in the presence of a few small curled hairs at the apex of the leaves. Similar to *H. pulchra* in its conspicuous bracts, but differing in leaf shape, leaf indumentum, its more emarginate sepals, and longer stamens with more slender filaments and larger oblong to elliptic anthers which are slightly tapered to an obtuse to subacute apex. *H. pulchra* has flattened to flat glabrous leaves, smaller oblong to obovate anthers with a slightly incurved obtuse to truncate apex and coarser staminal filaments fused for most of their length. *H. pulchra* var. *acutibractea* sometimes has curled hairs on the leaves but these are either confined to the lower half of the leaf or spread evenly over the leaf and are never confined to the apex.

Note. Previously known by the phrase name *Hibbertia* sp. Bremer (J.R. Wheeler 2440).

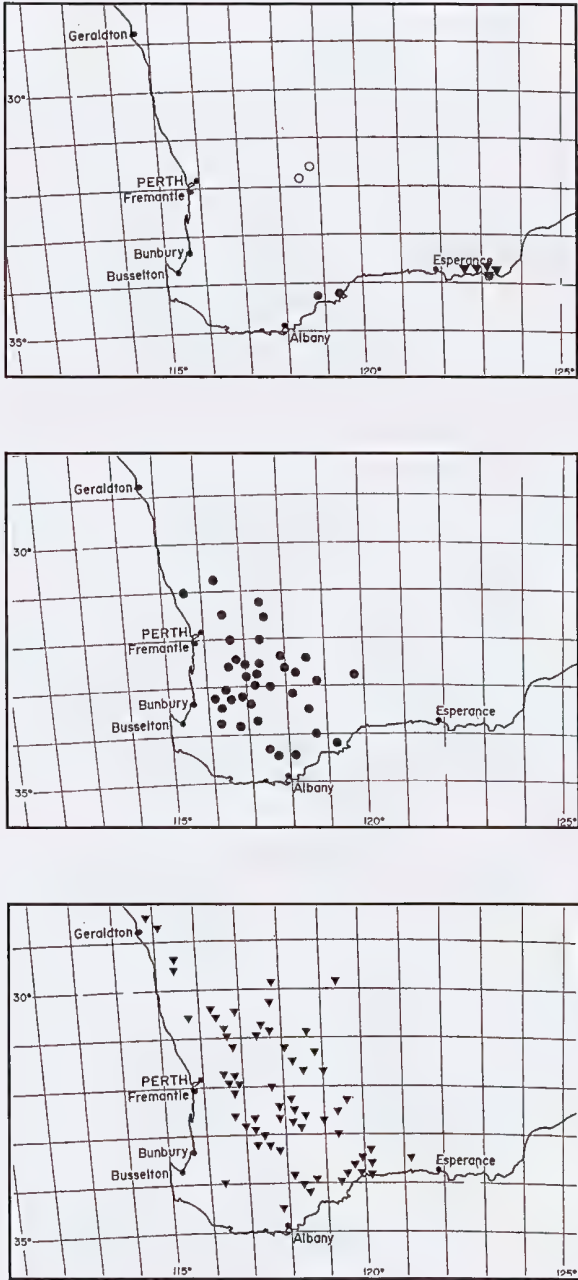


Figure 2. Distribution maps. A – *Hibbertia acrotrichion* ●, *H. chartacea* ○ and *H. hamata* ▼; B – *H. hemignosta*; C – *H. rupicola*.

2. *Hibbertia chartacea* J.R. Wheeler, *sp. nov.*

Hibbertiae hemignostae affinis sed foliis applanatis, bracteis magis conspicuis, sepalis chartaceis latioribus differt.

Typus: South side of Bruce Rock East Rd, 0.45 km west of its junction with Merredin–Narembreen road, Western Australia, 3 September 2001, *J.W. Horn* 4044 (*holo*: PERTH 06853102; *iso*: DUKE n.v.).

Shrubs to 0.5 m high; branchlets glabrescent but with short curled hairs. *Leaves* glaucous, in spirally arranged clusters, sessile, very narrowly oblong to very narrowly obovate, thick but flattened, 5–8 mm long, 0.5–0.8 mm wide, glabrous, midrib thickened below, apex more or less obtuse but very slightly recurved. *Flowers* terminating short axillary shoots, 7–15 mm diam., sessile; *bracts* 3 conspicuous, very broadly ovate to circular, 2–3 mm long, 2–3.5 mm wide, obtuse, the outermost firm in texture with a dark midline and distinctly caudate apex, the innermost chartaceous, easily torn and usually minutely apiculate. *Sepals* 5, often brown, basally fused, very broadly elliptic, chartaceous and easily torn, obtuse and apiculate; outer sepals 3.5–4 mm long, 2.5–3.5 mm wide; inner sepals 4–5 mm long, 3–4.5 mm wide. *Petals* 5, yellow, obovate, 4.5–8 mm long, emarginate. *Stamens* 11, 9 of them grouped into 3 fascicles and 2 single, *c.* 3 mm long; filament 1–2 mm long, the fascicles fused for at least two-thirds of their length; anther narrowly elliptic, 1.5–1.9 mm long, subacute to apiculate. *Carpels* 3, globular, 1–1.2 mm long, 0.8–1.2 mm wide; style erect, 1.5–2.5 mm long; ovule 1 per carpel. *Fruiting carpels* not seen mature. (Figure 1).

Specimens examined (all PERTH), WESTERN AUSTRALIA: 26 km due SE Bodallin, 16 Sep. 1982, *R.J. Cranfield* 2367; 24 km SSE Carrabin and NNE of Noombenderry Rock, flora and fauna reserve on land survey blocks nos. 969 and 975, 15 Sep. 1982, *A. Strid* 20314; 24 km SSE Carrabin and NNE of Noombenderry Rock, flora and fauna reserve on land survey blocks nos. 969 and 975, 15 Sep. 1982, *A. Strid* 20530.

Distribution. Western Australia, South West Botanical Province, IBRA region of Avon Wheatbelt. Recorded only from SSE of Carrabin and east of Bruce Rock. (Figure 2).

Habitat. Recorded from shrubland and mallee shrubland on sandy or lateritic soils.

Phenology. Flowers recorded for September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. Apparently restricted in distribution, being recorded from few localities, although one from flora reserve.

Etymology. From the Latin *chartaceus* – papery, referring to the texture of the sepals and bracts.

Affinities. Similar to *Hibbertia hemignosta* in its stamens but differing in its flatter leaves, more conspicuous chartaceous bracts and its broader thin brownish sepals. The sepals and bracts of *H. chartacea* are very similar to those of *Hibbertia acrotrichion* being brownish, thin and easily torn, but its leaves are quite different. The leaves and bracts are quite similar to those of *Hibbertia pulchra*, however its stamens are longer, elliptic and tapered towards their apex as those of *H. hemignosta*.

3. *Hibbertia hamata* (F. Muell.) F. Muell., *Fragm. Phyt. Austral.* 4, 189 (1864). – *Hibbertia teretifolia* var. *hamata* F. Muell., *Fragm. Phyt. Austral.* 4, 117 (1864). *Type*: “a promontorio” Cape Le Grand, [Western Australia] (*holo*: MEL 666839).

Shrub erect to 0.5 m high; branchlets hairy with appressed, straight to slightly curved, often brownish hairs. *Leaves* clustered on spirally arranged short axillary shoots, sessile, extremely narrowly obtriangular, thick and very shallowly sigmoid, 3–10 mm long, 0.4–0.8 mm wide, margins somewhat revolute with the leaf appearing slightly longitudinally 2-grooved but the grooves very shallow and laterally expanded towards the leaf apex, the distal part of the leaf very thick and distinctly recurved, apiculate. *Flowers* terminating short shoots, sessile, 5–10 mm diam.; *bracts* apparently absent or 1 or 2 inconspicuous and subulate to leaf-like or ovate and long-caudate, usually 1–2 mm long. *Sepals* 5, thin, glabrous, the midrib extended as a caudate apex; outer sepals elliptic, 3–4.5 mm long, 1–2 mm wide, body 2–3 mm long, with a long caudate apex 1–2 mm long; inner sepals broadly elliptic, 4–4.5 mm long, 2–3 mm wide, body 3.5–4 mm long, with a caudate apex 0.5–1 mm long. *Petals* 5, yellow, obovate, shallowly emarginate, 3–6 mm long. *Stamens* 11, arranged in 3 fascicles of 3 stamens and 2 single stamens, 2–2.5 mm long; filament 0.5–1 mm long, those in fascicles clearly fused for two-thirds to three-quarters of their length; anther oblong-elliptic, 1–1.5 mm long, more or less obtuse and occasionally apiculate. *Carpels* 3, more or less globular, 0.6–1 mm diam., glabrous; ovule 1 per carpel; style 1.5–2 mm long. *Fruiting carpels* broadly ellipsoid, 1.5–2 mm high; seed brown, ellipsoid, c. 1.5 mm long, with a greatly divided white waxy aril extending for half the length of the seed. (Figure 4A)

Other specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: Condingup Peak, c. 25 miles [40 km] E of Esperance, 4 Oct. 1971, *R.D. Hoogland* 12061 (duplicates CANB, L n.v.); c. 8 km SW of Mt Boyatup (Mt Boyatup is c. 110 km E of Esperance), 5 Oct. 1968, *E.N.S. Jackson* 1339 (duplicate AD n.v.); Boyatup Hill, c. 110 km E of Esperance just N of Fisheries Rd, 1 Oct. 1968, *A.E. Orchard* 1281 (duplicate AD n.v.); Howick Hill, c. 100 km E of Esperance just N of Fisheries Rd, 2 Oct. 1968, *A.E. Orchard* 1304 (duplicate AD n.v.); Boyatup Hill, c. 130 km E of Esperance, on road to Israelite Bay, 18 Dec. 1974, *R. Pullen* 10.084 (duplicate CANB n.v.); Thomas River, Cape Arid National Park, E of Esperance, 1 Dec. 1971, *R.D. Royce* 9943; N of Howick Hill on Howick Hill Rd, 2.8 km NW of Henkes Rd, 3 Oct. 1982, *B.L. Rye* 82027 (duplicate CANB n.v.); Boyatup Hill, c. 1 km N of road from Esperance to Cape Arid National Park, 19 km from W border of park, 8 Nov. 1982, *A. Strid* 21250; Mt Howick, 1 Oct. 1968, *P.G. Wilson* 8163 (duplicates K, MEL); 75 miles [120 km] from Esperance towards Balladonia via Condingup, 3 Nov. 1968, *J. Wrigley s.n.* (duplicate CBG n.v.).

Distribution. Western Australia, South West Botanical Province, IBRA region of Esperance Plains. Recorded from between Condingup and Cape Arid. (Figure 2A).

Habitat. Granitic hills, often inland from the coast.

Phenology. Flowers and fruits recorded for October to December.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. *Hibbertia hamata* appears to be restricted in distribution to inland granitic hills between Condingup and Cape Arid.

Affinities. This species, originally considered to be a variant of *H. teretifolia*, has certain affinities to both *H. hibbertioides* and *H. rupicola*, in its similar caudate sepals and densely clustered leaves. Its leaves are perhaps intermediate between these two species in the degree of recurvedness of the leaf margin,

the leaves being only slightly longitudinally grooved on the lower surface and certainly not as clearly grooved as those of *H. rupicola*. However, *H. hamata* clearly differs from both *H. hibernioides* and *H. rupicola* in its extremely narrowly obtriangular (rather than linear) leaf shape and shallowly sigmoid leaf posture. The flowers are always sessile, whereas those of both *H. hibernioides* and *H. rupicola* vary from sessile to pedunculate. The stamens (as they are in *H. hibernioides*) are consistently 11 in number with 3 fascicles of 3 stamens and 2 free stamens, whereas those of *H. rupicola* (although most commonly as in the other two species) may vary in number from 9–17 with up to 6 stamens in any one fascicle and occasionally with up to 5 fascicles.

4. *Hibbertia hemignosta* (Steud.) J.R. Wheeler in H.R. Toelken & J.R. Wheeler, *J. Adelaide Bot. Gard.* 20: 1–4 (2002). – *Pleurandra hemignosta* Steud., *Pl. Preiss.* 1: 265 (1845). *Type*: Southwestern Australia, *Preiss* 2172 (*holo*: LD).

Shrub to 0.3(0.5) m high, prostrate to erect; branchlets glabrescent, with appressed curled hairs. *Leaves* spirally arranged, mostly clustered on very short axillary shoots, sessile, linear and terete to more or less triangular in section, (3)4–10(12) mm long, 0.3–0.7 mm wide, usually glabrous, obtuse to apiculate; leaf base sometimes flattened, slightly dilated and ciliate. *Flowers* sessile, solitary terminating short axillary shoots, 9–15 mm diam.; *bracts* 2–4, ovate to broadly ovate or elliptic to broadly elliptic, 1–1.5 mm long, 0.7–1.5 mm wide, obtuse to subacute and often long-apiculate, outermost bracts usually with a dark caudate apex equal to almost half the total length, glabrous or woolly ciliate. *Sepals* 5, elliptic, glabrous, with paler membranous margins, obtuse to subacute and often with a tiny apiculate point up to 0.2 mm long, glabrous or the margins woolly ciliate; outer sepals 2.5–3.5(4) mm long, 1–2.5 mm wide; inner sepals broader and longer, 3.5–5(5.5) mm long, (2.5)3–4.5 mm wide. *Petals* 5, obovate, 4–7 mm long, obtuse to shallowly emarginate. *Stamens* 11, 9 of them grouped into 3 fascicles and 2 single, 2.5–3 mm long; filament 1–2 mm long, in the fascicles fused for at least two-thirds of their length; anther narrowly elliptic, (1)1.2–1.8 mm long, sometimes apiculate. *Carpels* 3, more or less erect, 1–1.5 mm long, 0.5–1 mm wide; style 2–2.5 mm long; ovules 1 per carpel. *Fruiting carpels* obovoid, c. 2.5 mm long, 1.5 mm wide; seed brown, ellipsoid, c. 1.5 mm long and c. 1 mm wide. (Figure 3A–D).

Selected specimens examined. (all PERTH except where indicated). WESTERN AUSTRALIA: Plot 5191, Yerriminup Rd, 9 Aug. 1993, A.R. Annels 3456; Quairading, town limit on road to Tammin, Avon district, 20 July 1980, M.D. Crisp 6611 (duplicates CBG, NSW *n.v.*); on northern side of gridline, c. 25 metres NE of South Ironcap Trig, 7 Sep. 1996, N. Gibson & K. Brown 2522; Kukerin Rd North East, 1.3 km NE of Kukerin, 9 Sep. 1999, M. Graham 1098; Metro Rd, Gibbs State Forest, Shire of Wandering; 2.5 km S of Division Track, 22 Aug. 1999, F. Hort 545; 10 km SW of Toodyay, 10 Aug. 1973, A. Kanis 1670 (duplicate CANB *n.v.*); Site 62, off Boundary Rd, 9 km NNE of Mt Dale bearing W, 6 Aug. 1997, G. Paull 1073; 8 miles [13 km] S of Chester Pass, Stirling Range, 14 Aug. 1951, R.D. Royce 3715; Dumbleyung–Lake Grace road, 11.9 km W of Tarin Rock and c. 34 km W of Lake Grace, 21 Sep. 1986, J.R. Wheeler 2407; just N of Toolibin, 2 km N of Line Rd on Narrogin–Harrismith road, 11 Oct. 2001, J.R. Wheeler 4143 (duplicate AD); 14 miles [22 km] E of Ongerup, Aug. 1957, C.L. Wilson & D.M. Churchill CLW796; 1 mile [1.6 km] E of Wyalkatchem, 15 June 1974, E. Wittwer 1222.

Distribution. Western Australia, South West Botanical Province, IBRA regions of Swan Coastal Plain, Jarrah Forest, Avon Wheatbelt and Mallee. Recorded from north of Yerrecoin south to just south of the Stirling Range and east to South Ironcap and just west of the Fitzgerald River National Park. (Figure 2B).

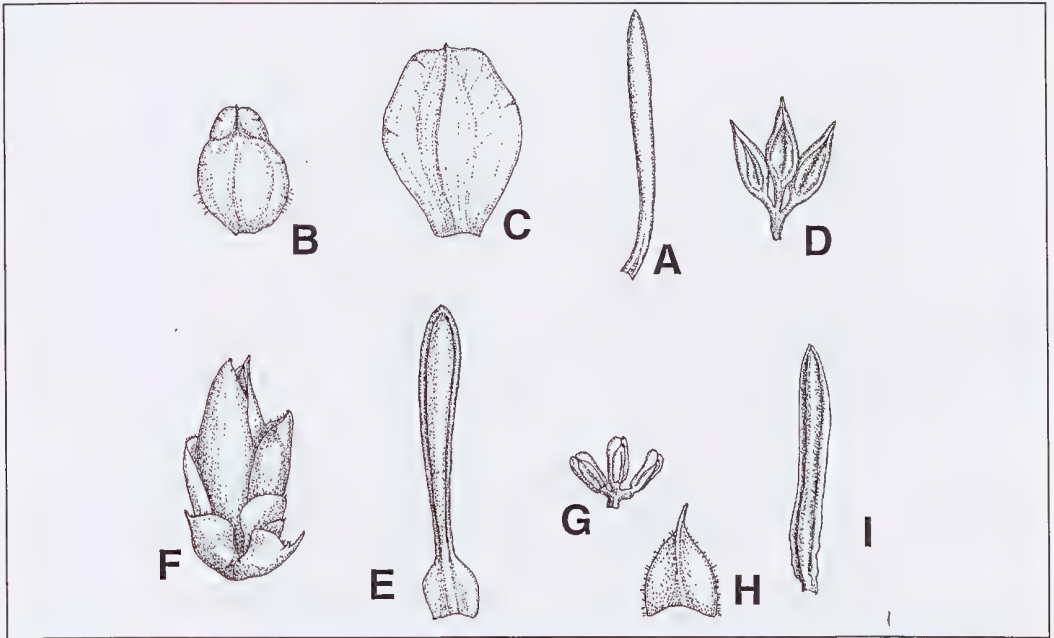


Figure 3. A–D. *Hibbertia hemignosta*. A – leaf (x8), B – outer sepal (x8), C – inner sepal, D – staminal bundle; E–G. *Hibbertia pulchra* var. *pulchra*. E – leaf (x8), F – flower showing bracts and sepals only (x8), G – staminal bundle (x8); H – *Hibbertia pulchra* var. *acutibractea*, bract (x8); I – *Hibbertia pulchra* var. *crassinervia*, leaf (x8). Drawn from G.J. Keighery 9321 (A–D), R.D. Royce 2375 (E–G), J.R. Wheeler 2490 (H) and G.J. Keighery & J. Alford 1613 (I).

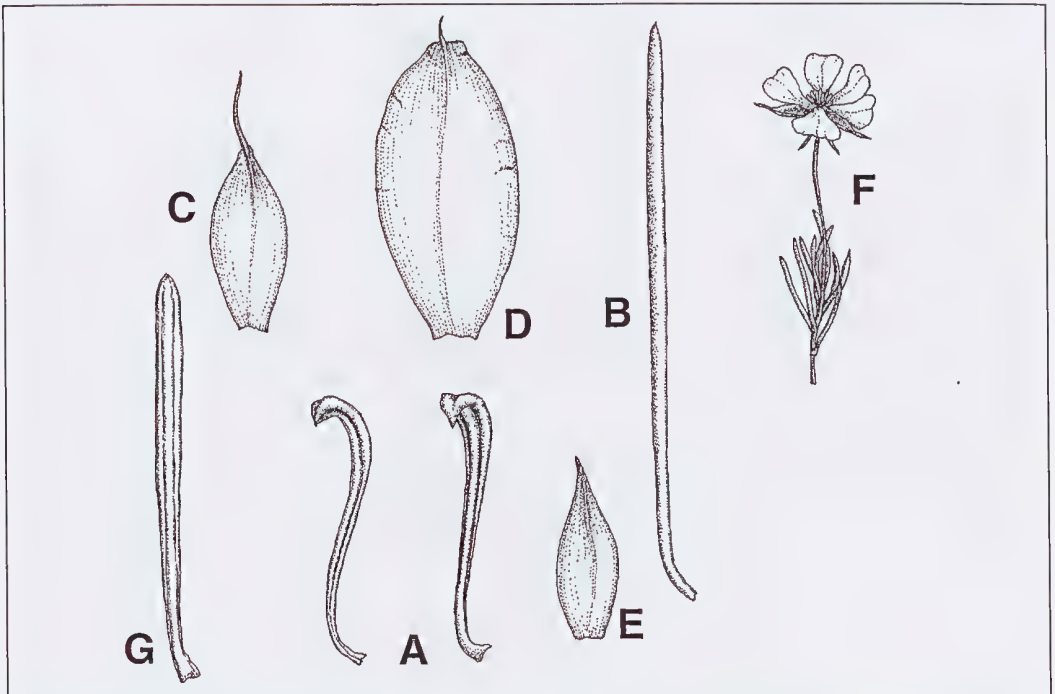


Figure 4. A – *Hibbertia hamata*, leaves (x8); B–D. *Hibbertia hiebertioides* var. *hiebertioides*. B – leaf (x8), C – outer sepal (x8), D – inner sepal (x8); E – *Hibbertia hiebertioides* var. *meridionalis*, outer sepal (x8); F – *Hibbertia hiebertioides* var. *pedunculata*, flower (x2); G – *Hibbertia rupicola*, leaf (x8). Drawn from B.L. Rye 82027 (A), M.G. Allen 1023 (B–D), J.R. Wheeler 4151 (E), R..J. Cranfield 4687 (F). and M.S. Graham 1047 (G).

Habitat. Occurs on a variety of soils in heath, shrubland, woodland or forest.

Phenology. Flowers recorded June to October; fruits recorded October and November.

Conservation status. Widespread and not believed to be under threat.

Affinities. Differing from *Hibbertia hibernioides* in its bracts, the apex of the sepals and the degree of fusion of the stamens. The leaves of *H. hibernioides* are more commonly terete, the bracts narrower, the sepals usually distinctly caudate and the stamens more variable in their degree of fusion into fascicles and bearing more oblong anthers. The fusion of the stamens in *H. hemignosta* is such that two anthers are held side by side and the third held forwards towards the centre of the flower. This is a common arrangement of anthers in many species of section *Candollea*, but it is not clearly seen in the collections of *H. hibernioides*, perhaps due to their lesser degree of fusion.

Notes. Collections from South Ironcap have particularly glaucous foliage (*N. Gibson & K. Brown* 2522, 3058, *M.D. Carter* 549). Some collections from Tuttanning Reserve east of Pingelly may be intermediate between *H. hemignosta* and *H. hibernioides*. See note under *H. hibernioides* var. *hibbertioides*.

5. *Hibbertia hibernioides* (Steud.) J.R. Wheeler in H.R. Toelken & J.R. Wheeler, *J. Adelaide Bot. Gard.* 20: 1–4 (2002). – *Pleurandra hibernioides* Steud., *Pl. Preiss.* 1: 265 (1845). *Type:* Mt Bakewell [near York, Western Australia], *L. Preiss* 2164 (*holo:* LD; *iso:* MEL 666837).

Candollea teretifolia Turcz., *Bull. Soc. Natural. Moscou* 22(2): 6(1849) – *Hibbertia teretifolia* (Turcz.) F. Muell., *Fragm. Phyt. Austral.* 4: 117 (1864). *Type:* New Holland, *J. Drummond* 4, 124 (*holo:* KW; *iso:* MEL 666838, PERTH 04430506).

Shrub, prostrate or sprawling to 0.3 m high, rarely erect and to 0.7 m high; branchlets usually glabrous or occasionally glabrescent with minute curled hairs on the young growth. *Leaves* crowded, pale, greyish or glaucous, spirally arranged and often densely clustered on short axillary shoots, sessile to subsessile, linear and terete to triangular in section or very slightly flattened, 3.5–17 (23) mm long, 0.3–0.6(0.8) mm wide, glabrous, slightly tapered towards a distinctly apiculate apex. *Flowers* solitary, axillary or terminating short leafy shoots, subsessile to distinctly pedunculate or less often sessile, (8)10–15 mm diam.; *peduncle* when present up to 17 mm long, often much shorter in bud; *bracts* inconspicuous, subulate or ovate and long-caudate, 1–2 mm long, 0.2–0.7 mm wide, sometimes ciliolate. *Sepals* 5, pale green and sometimes tinged with purple, glabrous, caudate; outer sepals elliptic, (3.5)4.5–7 mm long, the body 3–5 mm long, 1.5–2.5 mm wide, distinctly shorter than that of the inner sepals, acute to more or less obtuse but with the midrib extended as a usually conspicuous caudate tip (0.2–0.5)1–3 mm long; inner sepals broadly elliptic, (4)5.5–7.5 mm long, 2.5–3 mm wide, the body 4.5–7 mm long and more obtuse with a caudate tip (0.2–0.5)0.5–2 mm long. *Petals* 5, yellow, obovate, (3–4)5–9 mm long, shallowly emarginate. *Stamens* (10)11, 9 of them grouped in 3 fascicles each of (2)3 stamens and also with 1 or 2 separate stamens, 2.5–3.5 mm long; filament 1–2 mm long, varying from distinctly to scarcely fused, most commonly only shortly fused and often with 2 of the 3 filaments fused to a greater degree than the third; anther oblong-elliptic, (0.8)1.5–1.8(2) mm long, often apiculate. *Carpels* 3, erect, 0.8–1.2 mm long, 0.5–1 mm wide, glabrous; style 2–3 mm long; ovules 1 per carpel. *Fruiting carpels* obovoid-ellipsoid, 2–2.5 mm long, c. 1.5 mm wide; seeds brown, very broadly ellipsoid to globular, 1.2–1.5 mm diam., with a large white and greatly divided waxy aril extending c. half the length of the seed.

Affinities. Previously confused with *Hibbertia hemignosta* and included by Hoogland (1974) under *H. enervia*. *Hibbertia hibernioides* clearly differs from *H. hemignosta* in its longer and usually distinctly caudate sepals and in its narrower bracts which are less conspicuous and subulate to ovate and caudate. *H. hibernioides* differs from *H. rupicola* in its usually thicker leaves which are terete to semi-terete in cross-section and which have no signs of the revolute leaf margin characteristic of *H. rupicola*. The stamens of *H. hibernioides* are variable in the degree of staminal filament fusion and are frequently only very shortly fused, whereas those of both *H. hemignosta* and *H. rupicola* are fused for much of their length.

Notes. Three infraspecific taxa are recognised. Varietal rank has been adopted for these entities because they all have similar leaves, bracts, sepals and stamens. Var. *pedunculata* is not separated geographically or ecologically from var. *hibbertioides* but has a clearly defined and easily observable character difference. Var. *meridionalis*, although clearly separated both geographically and ecologically from the other two taxa, exhibits differences that are less clearly defined.

Key to varieties of *Hibbertia hibernioides*

1. Flowers sessile to subsessile
2. Sepals with conspicuously caudate sepals, the caudate apex of the outer sepals (0.5)1–3 mm long. Stamens 2.5–3.5 mm long, anther (1.2)1.4–1.7 mm long var. **hibbertioides**
2. Sepals with inconspicuously caudate sepals, the apex of the outer sepals 0.5–0.8 mm long. Stamens 1.5–2 mm long, anther 0.8–1 mm long var. **meridionalis**
1. Flowers pedunculate, the peduncle (3)5–17 mm long var. **pedunculata**

5a. *Hibbertia hibernioides* (Steud.) J.R. Wheeler var. **hibbertioides**

Shrub to 0.3 m, often prostrate or sprawling. *Leaves* sometimes glaucous, terete to semi-terete, occasionally somewhat flattened, 4–10(14) mm long, 0.4–0.6(1) mm wide. *Flowers* 10–15 mm diam., sessile or subsessile; *bract* subulate or ovate-oblong and long-caudate. *Sepals* 5–7 mm long, apex long-caudate with the tip of the outer sepal (0.5)1–2.5(3) mm long. *Petals* 5–9 mm long. *Stamens* 2.5–3.5 mm long; anther 1.3–1.8(2) mm long. (Figure 4B–D).

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: 5 km from Darkan along road to Williams, Darling District, 22 Jan. 1979, *B. Barnsley* 833 (duplicate CBG *n.v.*); 9.7 miles [15.5 km] from Gingin towards Bindoon at the Moora–Mogumber turnoff, 28 Sep. 1968, *E.M. Canning* WA/68 3568 (duplicates CANB, CBG, L all *n.v.*); crown land, 3.5 km at 65 degrees from Mount Lesueur, NE of Jurien, 11 Oct. 1979, *E.A. Griffin* 2360; Tuttanning Reserve (17 miles [26 km] E of Pingelly) 17 Oct. 1967, *G. Heinsohn* 99; on track to Mt Nyroomanning, NE of Bindoon, 18 Oct. 1998, *M. Hislop* 1162; along Great Northern Highway some miles N of South Bindoon, 11 Nov. 1974, *R.D. Hoogland & G.L. Stebbins* 12495 (duplicates CANB, HBG, K, L, NSW, TNS, UC, US all *n.v.*); Oakley Dam, Dwellingup, 27 Oct. 1906, *P.C. Kimber* 216; Chittering, 2 Dec. 1953, *R.D. Royce* 4713; lower N–NE slopes of Mt Bakewell, c. 3.5 km due NNW of York, 16 July 1984, *J.R. Wheeler* 2271; 70 km S of Moora on the Great Northern highway, 3 Nov. 1974, *D.J.E. Whibley* 4984 (duplicate AD *n.v.*).

Distribution. Western Australia, South West Botanical Province, IBRA regions of Geraldton Sandplain, Swan Coastal Plain, Jarrah Forest and Avon Wheatbelt. Recorded from Mt Lesueur to Dwellingup and Darkan, extending east to Tuttanning Reserve east of Pingelly. (Figure 5A).

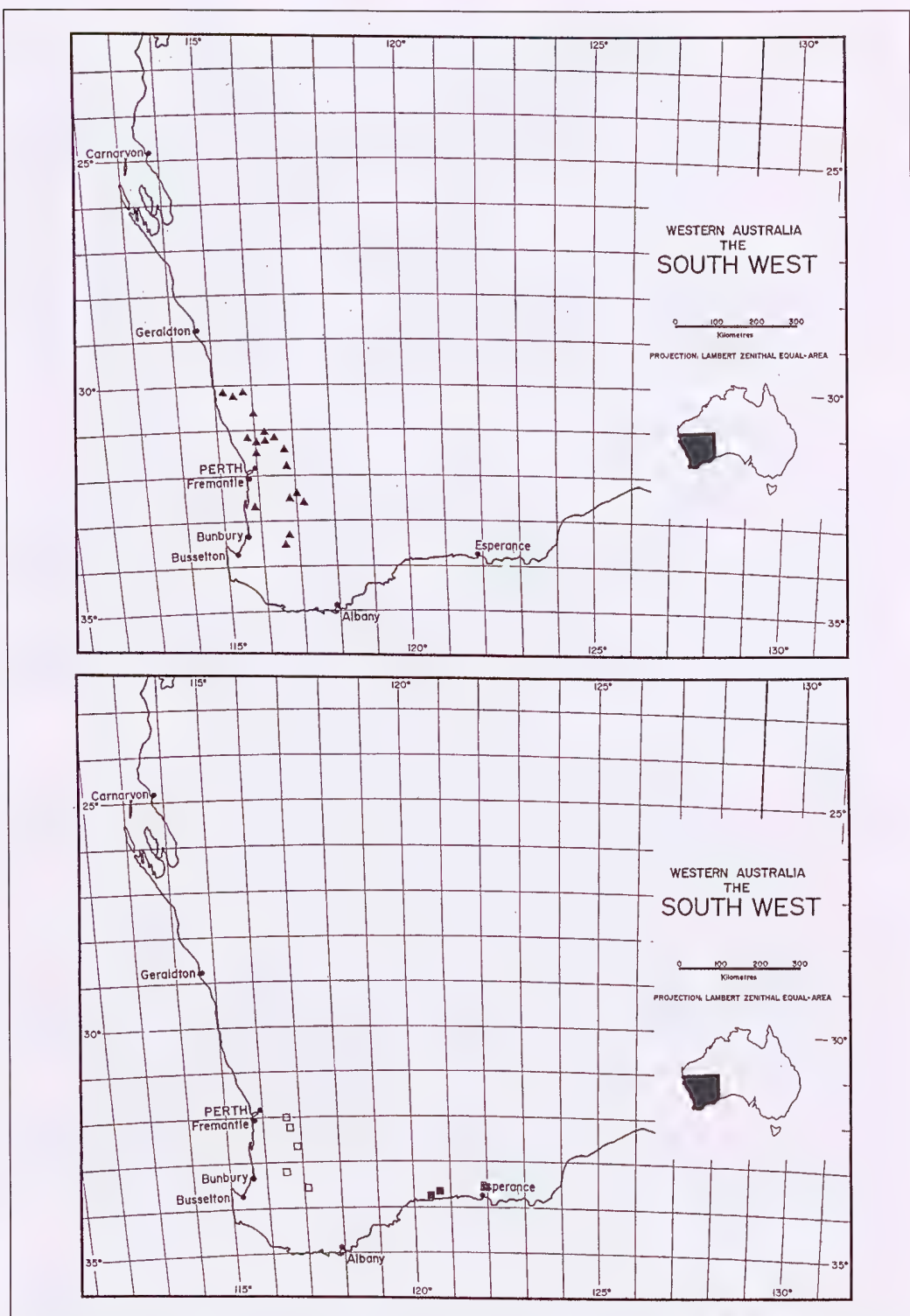


Figure 5. Distribution of *Hibbertia hibernioides*. A – var. *hibertioides* ▲; B – var. *meridionalis* ■ and var. *pedunculata* □.

Habitat. Occurs usually on lateritic soils in eucalypt woodland or heath.

Phenology. Flowers recorded June to December; fruits recorded November to January.

Conservation status. Widespread and not considered under threat.

Notes. Some collections from Dryandra and Tuttanning have somewhat flatter leaves 0.6–1 mm wide (*G. Heinsohn* 99, *T.E.H. Aplin* 786 & 843). Collections from the Tuttanning Reserve east of Pingelly are sometimes somewhat intermediate between *H. hibbertioides* var. *hibbertioides* and *H. hemignosta* in sepal and bract characteristics (*T.E.H. Aplin* 825, *P.G. Wilson* 3908, *J.R. Wheeler* 4131), which may indicate some degree of hybridisation.

5b. *Hibbertia hibbertioides* var. *meridionalis* J.R. Wheeler, var. nov.

A var. *hibbertioides* apice sepalorum acuminato vel breviter caudato et floribus parum parvioribus differt.

Typus: Springdale Rd, 4.7 km E of Fence Rd, 33°51'S, 120°34'E, Western Australia, 19 March 2002, *J.R. Wheeler* 4153 (*holo:* PERTH 06331092; *iso:* AD, CANB, K, MEL, NSW).

Shrub to 0.3 m high. *Leaves* usually green, terete, 10–23 mm long, c. 0.5 mm wide. *Buds* sessile. *Flowers* 7–8 mm diam., sessile; *bracts* subulate or ovate-elliptic and long-caudate. *Sepals* 3.5–5.5 mm long, apex subacute to acuminate, apex of the outer sepal 0.2–0.5(0.8) mm long. *Petals* 3.5–4.5 mm long. *Stamens* 1.5–2(2.5) mm long; anther 0.8–1.2 mm long. (Figure 4E).

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: 26.1 km from Hopetoun on South Coast [Southern Ocean] Rd, c. 1 km to the S along un-named track, 19 Apr. 1998, *M. Bennett* 113; 8 km NW Broomstick Hill on Backmans Rd, 29 Mar. 1983, *M. Burgmann* & *S. McNee* 1105; 30.5 km SW of Munglinup, 15 May 1996, *R. Davis* 764; [C]oxall Rd (Munglinup), 8 Feb. 1987, *H. Demarz* 11703; 50 km along Springdale Rd off Hopetoun–Ravensthorpe road, 2 Jan. 1983, *A. Strid* 21903; Helms Arboretum, 1 Dec. 1993, *C. Turley* 7/1293; Southern Ocean Rd, c. 27 km E of junction with Hopetoun–Ravensthorpe road, 200 metres S along track towards sea, 19 Mar. 2002, *J.R. Wheeler* 4151 (duplicate AD); Springdale Rd, 4.4 km W from junction with Starvation Boat Harbour Rd, 19 Mar. 2002, *J.R. Wheeler* 4152.

Distribution. Western Australia, South West Botanical Province, IBRA regions of Esperance Plains recorded between just east of Hopetoun and just north and east of Esperance. (Figure 5B).

Habitat. Recorded from sandy soils in mallee woodland, mallee heath and heath often with *Banksia speciosa*, *Adenanthos cuneatus* and *Lambertia inermis*.

Phenology. Flowers recorded only apparently sparsely between December and May.

Conservation status. Recorded as common at some localities and occurring in coastal reserves but probably under-collected possibly due to its sparse flowering only during summer and autumn. Although restricted in distribution this taxon is not considered under threat.

Etymology. The name *meridionalis* refers to the southerly distribution of this variety.

Affinities. Differs from both var. *hibbertioides* and var. *pedunculata* in its sepals which are not distinctly caudate and also in its smaller flowers and usually shorter stamens.

Notes. Despite being clearly geographically and ecologically separated from the other two varieties of *H. hibbertioides* this taxon is treated at the varietal level as the differences are one of degree rather than presence or absence of a particular character. This is also in keeping with the choice of variety rather than subspecies for var. *pedunculata*. The apparent flowering period of var. *meridionalis* is of interest in that flowers have only been recorded from summer and autumn. Although sporadic summer and autumn flowers have been noted var. *hibbertioides* and var. *pedunculata* have their main period of flowering in spring and early summer. No collections of var. *meridionalis* have been made in spring. As the plants were not uncommon at several of the localities one would have expected collections to have been made in spring if the plants were in flower at that time.

5c. *Hibbertia hibbertioides* var. *pedunculata* J.R. Wheeler, var. nov.

A var. *hibbertioides* floribus distincte pedunculatis differt.

Typus: Catchment Rd, Talbot State Forest, York, 200 metres south of Defor Rd T junction, 31°59'S, 116°36'E, Western Australia, 6 October 1999, *F. & J. Hort* 647 (*holo*: PERTH 05440300; *iso*: AD, CANB, K).

Shrub to 0.2 m high, compact, often ground hugging and cushion-like. *Leaves* usually greyish to glaucous, terete to semi-terete, 5–13 mm long, 0.3–0.6(1) mm wide. *Flowers* 8–15 mm diam., pedunculate; *peduncle* slender, (3)5–18 mm long with occasional subulate leaf-like bracts. *Sepals* 4.5–7 mm long, the apex long-caudate with the tip of the outer sepal up to 3 mm long. *Petals* (4)5–8 mm long. *Stamens* 2.5–3.5 mm long; anther 1.3–1.7 mm long. (Figure 4F)

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: Site 14, Defor Rd, 3 km SSW of Coolakin Spring, 11 Nov. 1996, *M.G. Allen* 528; 35 km S of Arthur River, 20 Oct. 1983, *R.J. Cranfield* 4687; c. halfway between Collie and Williams, May 1972, *L. Dodd* s.n.; Flynn Forest Block, Shire of York, Crawler Rd 200 metres W of Kent Rd, 18 Apr. 1999, *F. Hort* 451; Dryandra State Forest, c. 7 km directly N of Contine, Dryandra Rd, 15 Oct. 1997, *T.R. Lally & B. Fuhrer* TRL1475; Dryandra State Forest, Narrogin map 1:100,000 grid, reference 027742, WA, 18 Sep. 1987, *D.M. Rose* 274; Private reserve (Luelf's), Talbot Rd, 5 Dec. 1997, *H. Seeds* 85; Mercer Rd, SW of York, 19 Nov. 1998, *H. Seeds* 120; 52 miles [83 km] E of Perth on York Rd, 11 Dec. 1971, *F.A. Sharr* 3649; Mercer Rd, 1.1 km W from Talbot Rd, 9 Oct. 2001, *J.R. Wheeler* 4130 (duplicate MEL).

Distribution. Western Australia, South West Botanical Province, IBRA regions of Avon Wheatbelt. Recorded from near York to south of Arthur River. (Figure 5C).

Habitat. Recorded from lateritic soils or sand, mainly in wandoo woodland or mixed wandoo, marri and powderbark woodland.

Phenology. Flowers mainly September to December, but flowers also recorded for April and May.

Conservation status. Documented as “plentiful” at some sites and occurring in State Forest. Not considered under threat.

Etymology. From the Latin *pedunculatus* – provide with a peduncle.

Affinities. Differs from *Hibbertia hibbertioides* var. *hibbertioides* and var. *meridionalis* in its distinctly pedunculate flowers. Otherwise very similar to var. *hibbertioides*, with both varieties occurring quite close together in the Dryandra area.

Notes. *Hibbertia hibbertioides* var. *pedunculata* is treated at the varietal level as there is no apparent distributional or ecological separation from var. *hibbertioides*. Some collections from the Dryandra area have shorter peduncles 2–5 mm long and also somewhat broader and flatter leaves 0.6–1 mm wide (A.G. Wells s.n., T.R. Lally & B. Fuhrer TRL1475). These specimens appear intermediate between the two varieties and may indicate hybridisation between the taxa. The Dryandra area is one where both these varieties and *Hibbertia hemignosta* occur and hybridisation between the taxa is suspected.

6. *Hibbertia pulchra* Ostenf., *Biol. Meddel. Krongel. Danske Vidensk. Selsk.* 3(2): 88 (1921). *Type:* Palgarup, south of Bridgetown, Western Australia, 2 October 1914, *Ostenfeld* 309 (*holo:* C n.v.; *iso:* MEL 666910, PERTH 04430522).

Shrub to 0.6 m high, sprawling to erect, often multistemmed. *Leaves* in axillary clusters, the clusters sometimes distant, sessile, often spreading, linear to very narrowly obovate, 4–25 mm long, 0.4–1.5(2.2) mm wide, somewhat flattened to flat or rarely semiterete, upper surface flat, lower surface flat or convex with a narrow or broad enlarged midrib, glabrous or rarely with curled hairs, obtuse. *Flowers* axillary or terminating short axillary shoots, sessile, 6–15 mm diam. *Bracts* 1–3, conspicuous or inconspicuous, circular to depressed ovate or ovate to elliptic, 0.5–3 mm long, 0.5–3 mm wide, herbaceous or thin and somewhat chartaceous, frequently ciliolate, obtuse, minutely apiculate or acute, the outermost sometimes with a leaf-like apex. *Sepals* 5, basally connate, broadly elliptic to elliptic, sometimes ciliolate, obtuse or minutely apiculate; outer sepals 2–4(5) mm long, 1.2–3.5 mm wide; inner sepals 3.5–5(6) mm long, 2–4 mm wide. *Petals* 5, yellow, obovate, 4–9 mm long, emarginate. *Stamens* 11 arranged in 3 fascicles each of 3 fused stamens and 2 free stamens, 1.5–2.5(3) mm long; filaments fused for most of their length but one of the 3 longer and held inwards; anther oblong to obovate with the tip slightly incurved, apex often dilated after anthesis, 0.8–1.5 mm long; staminodes absent. *Carpels* 3, globular to ellipsoid, 0.6–1.2 mm long; style 1–2.5 mm long; ovule 1 per carpel. *Fruiting carpels* ovoid to ellipsoid, 1.5–2 mm long; seed brown ellipsoid, 1.5–1.8 mm long with a white waxy basal aril.

Notes. Three infraspecific taxa are recognised. Varietal rank has been adopted because the taxa are all quite similar in overall morphology and there is no clear ecological or distributional separation.

Key to varieties of *Hibbertia pulchra*

1. Bracts conspicuous, 1.5–3 mm long. Upper leaf surface flat,
lower surface with a narrow raised midrib, rarely leaf semi-terete
2. Bracts circular to depressed ovate, 2–3 mm wide var. **pulchra**
2. Bracts ovate to elliptic, 1–1.3 mm wide var. **acutibractea**
1. Bracts inconspicuous, 0.5–1.5 mm long. Upper leaf surface flat,
lower surface with a broad raised midrib var. **crassinervia**

6a. *Hibbertia pulchra* Oenfr. var. *pulchra*

Shrub, multistemmed, sprawling to 0.6 m high. *Leaves* in axillary clusters, the clusters sometimes distant, sessile, often spreading, linear to very narrowly obovate, 5–25 mm long, 0.5–1.5(2.2) mm wide, flat but quite thick and often with a narrow raised midrib on the lower surface, glabrous, obtuse. *Flowers* axillary or terminating short axillary shoots, sessile, 8–15 mm diam. *Bracts* 2 or 3, conspicuous, circular to depressed ovate, 1.5–3 mm long, (1.5)2–3 mm wide, thin and somewhat chartaceous, frequently ciliolate, obtuse and sometimes minutely apiculate, the outermost often with a leaf-like apex. *Sepals* 5, basally connate, broadly elliptic, often ciliolate, obtuse and often minutely apiculate; outer sepals 3–4(5) mm long, (2)2.5–3.5 mm wide; inner sepals 4–5(6) mm long, (2.5)3–4 mm wide. *Petals* 5, yellow, obovate, 4–9 mm long, emarginate. *Stamens* 11 arranged in 3 fascicles each of 3 fused stamens and 2 free stamens, (1.5)2–2.5(3) mm long; filaments fused for most of their length but one of the 3 longer and held inwards; anther oblong to obovate with the tip slightly incurved, apex often dilated after anthesis, 1–1.5 mm long. *Carpels* 3, globular to ellipsoid, 0.6–1.2 mm long; style 1–2.5 mm long; ovule 1 per carpel. *Fruiting carpels* not seen mature. (Figure 3E–G).

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: Dinninup proposed reserve, 20 July 1957, *E.M. Bennett* 2030; end of road to McKenna property off Sandalwood Rd, S of Bowelling, 13 Sep. 1993, *V. Crowley* 403; W side of Gardner Rd, 0.5 km NW of Mount Gardner base, Two Peoples Bay Nature Reserve, 15 Nov. 1991, *N. Gibson & M. Lyons* 1135; along Muir highway, c. 4 miles [6.5 km] W of Lake Muir, 19 Oct. 1971, *R.D. Hoogland* 12157 (duplicates A, BISH, CANB, E, HBG, K, L, MEL, NSW all n.v.); Site 77, 7 km ESE of Noggerup, 12 Sep. 1997, *P.A. Jurjevich* 2156; Capel Nature Reserve, 12 Sep. 1994, *G.J. Keighery* 13566; Unicup Nature Reserve, 28 Oct. 1997, *G.J. Keighery & N. Gibson* 2200; Palgarup, 25 Oct. 1947, *R.D. Royce* 2375; Bridgetown–Pemberton district, Sep. 1935, *T.N. Stoate s.n.*; Muir highway, c. 33 km ESE of Nyamup and c. 110 km W of Mt Barker, 29 Sep. 1986, *J.R. Wheeler* 2482.

Distribution. Western Australia, South West Botanical Province, IBRA regions of Swan Coastal Plain, Jarrah Forest and Warren. Recorded from Collie and Capel south east to Lake Muir and also just east of Albany at Two Peoples Bay. (Figure 6A).

Habitat. Sandy soil in heath, shrubland, woodland and forest.

Phenology. Flowers recorded July to November.

Conservation status. Not regarded as endangered.

Affinities. Differs from *Hibbertia hemignosta* in its stamens which have oblong to obovate anthers in which the tip is slightly incurved and the apex often dilated after anthesis. The staminal filaments of the fascicles are fused for most of their length but one of the 3 is longer and held inwards. *Hibbertia pulchra* var. *pulchra* also has very conspicuous broad bracts and flat or somewhat flattened leaves.

6b. *Hibbertia pulchra* var. *acutibractea* J.R. Wheeler, var. *nov.*

A var. *pulchra* bracteis angustioribus acutioribus differt.

Typus: Bluff Knoll, Stirling Range, 34°22'S, 118°15'E, Western Australia, 27 September 1966, *P.G. Wilson* 4177 (*holo*: PERTH 03030741; *iso*: GAUBA, MEL, NSW, WAIT all n.v.).

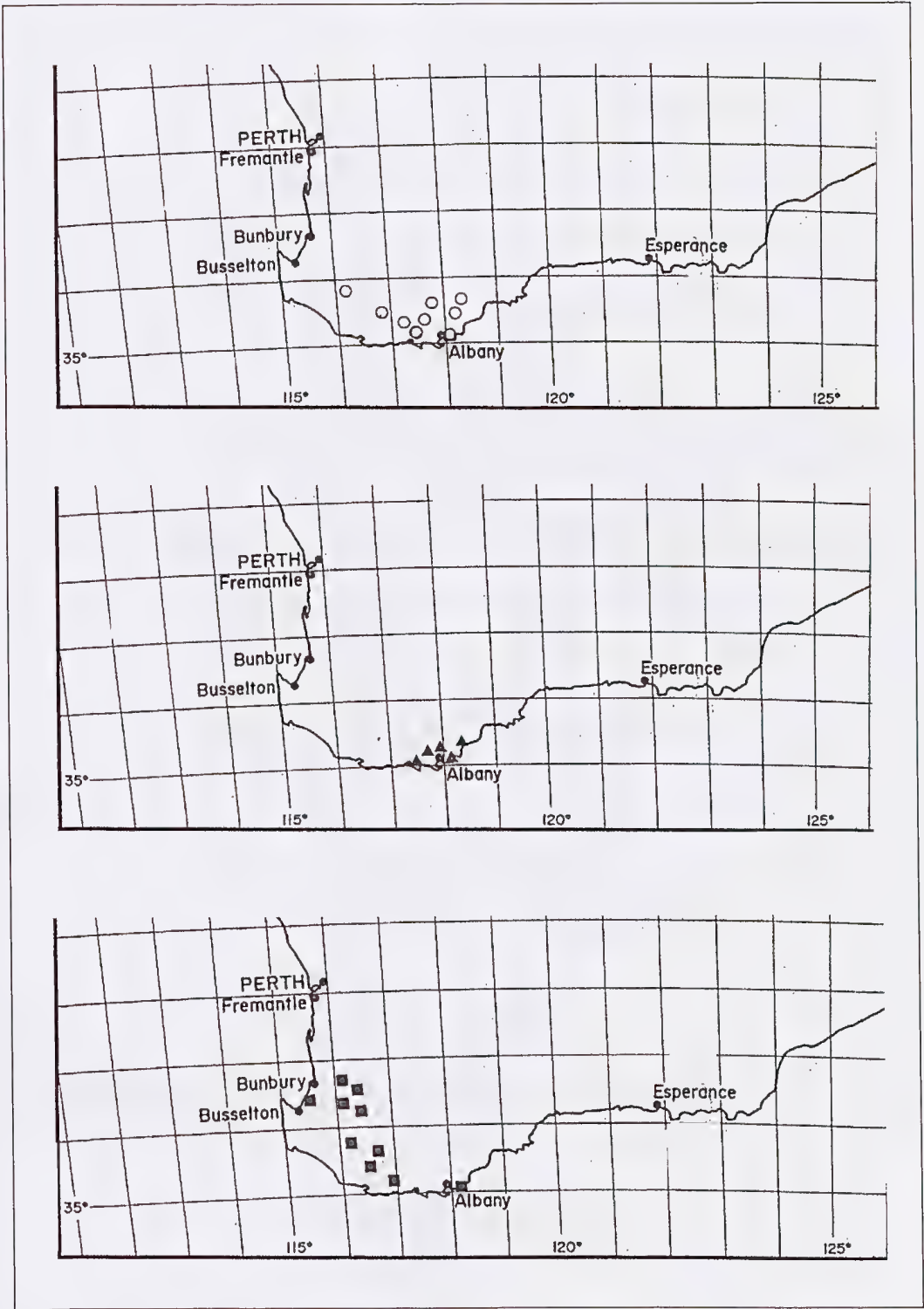


Figure 6. Distribution of *Hibbertia pulchra*. A – var. *acutibractea*. B – var. *crassinervia*. C – var. *pulchra*.

Shrub sprawling to erect, sometimes multistemmed, to 0.5 m high. *Leaves* in axillary clusters, the clusters often distant, sessile, linear, 4–19 mm long, 0.6–1.4 mm wide, flat to semi-terete, upper surface flat, lower surface flat or with a narrow raised midrib or occasionally rounded, glabrous or with curled hairs, apex obtuse. *Flowers* axillary or terminating short axillary shoots, 7–15 mm diam. *Bracts* 1–3, conspicuous, elliptic or ovate-elliptic, 1.5–2.5 mm long, 1–1.3 mm wide, often ciliolate, subacute to acute, sometimes apiculate. *Sepals* 5, basally connate, elliptic to oblong-elliptic, obtuse; outer sepals 3–4 mm long, 1.3–2.5 mm wide; inner sepals 3.5–5 mm long, 2–2.5 mm wide. *Petals* 5, yellow, obovate, 4–8 mm long, shallowly emarginate. *Stamens* 11 arranged in 3 fascicles each of 3 fused stamens and 2 free stamens, 1.5–2.5 mm long; filaments fused for most of their length but one of the 3 longer and held inwards; anther oblong to obovate with the tip slightly incurved, apex often dilated after anthesis, 1–1.3 mm long. *Carpels* 3, more or less globular *c.* 1 mm long, *c.* 0.8 mm wide; style *c.* 2 mm long; ovule 1 per carpel. *Fruiting carpels* obovoid-ellipsoid, *c.* 2 mm long and 1.3 mm wide; seed ellipsoid, *c.* 1.8 mm long, with a white basal aril. (Figure 3H).

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: Plot 5040, *c.* 22 km N of Denmark near Blue Lake, 7 Nov. 1991, A.R. Annels 1908; Reserve near Quick's farm, Saint Werburgh's Rd off Albany highway near Mount Barker, 12 Sep. 1982, E.J. Croxford 1863; Ledge Beach Rd, Lower Kalgan, 9 Sep. 1983, E.J. Croxford 2675; Denmark Shire, Sheepwash State Forest, *c.* 1 km S along track from N boundary which starts 2.3 km E from Denmark–Mount Barker road, 16 Aug. 1993, B.G. Hammersley 906; Mersea Lake, Wilgarup, Nov. 1962, W.A. Lonergan 213; Mount Barker, Plantagenet district, 9 Nov. 1840, L. Preiss 2155 (duplicates LD, MEL); Site 146, W off Denbarker Rd, 22 Aug. 1997, K.A. Redwood 212; *c.* 900 m WNW of Mt Martin, Albany, 19 Aug. 1998, E.M. Sandiford 83; Muir highway, Warren District, 1 Oct. 1970, P. Skinner 77; Red Gum Pass, *c.* 1 km N of Red Gum Springs, Stirling Range, 30 Sep. 1986, J.R. Wheeler 2499 (duplicates AD, CANB, K).

Distribution. Western Australia, South West Botanical Province, IBRA regions of Jarrah Forest. Recorded between the Stirling Range and Albany extending west to the Muir highway near Perillup Hall with an isolated occurrence south of Bridgetown. (Figure 6B).

Habitat. Occurs on sandy, gravelly or loamy soils in forest, woodland and shrubland.

Phenology. Flowers recorded July to November; fruits recorded for November.

Conservation status. Not regarded as endangered.

Etymology. From the Latin *acutus* – acute, pointed and *bractea* – bract, referring to the acute rather than obtuse bracts.

Affinities. Differs from *Hibbertia pulchra* var. *pulchra* in the shape of its bracts which are more or less elliptic, more or less acute and narrower and often less conspicuous than those of *H. pulchra* var. *pulchra*.

Notes. A suite of specimens from the Stirling Range, Mount Barker and South Stirling have leaves which are more semi-terete in section and have an indumentum of curled hairs on the leaves but are otherwise typical of this taxon.

6c. *Hibbertia pulchra* var. *crassinervia* J. R. Wheeler, var. nov.

Var. *pulchrae* affinis sed costa foliorum lata, incrassata, et lamina marginali angusta, bracteis parvioribus inconspicuis differt.

Typus: Albany, c. 4 km east of intersection between Chester Pass Rd and South Coast Highway, 35°0'S, 117°53'E, Western Australia, 25 September 1986, J.R. Wheeler 2453 (*holo*: PERTH 03076601; *iso*: AD, CANB, K, MEL).

Shrub to 0.5 m high. *Leaves* in axillary clusters, the clusters sometimes distant, sessile, linear, 4–15(25) mm long, 0.4–1 mm wide, upper surface flat, lower surface with a broad much-enlarged raised midrib and very narrow thin marginal blade, glabrous, apex obtuse. *Flowers* axillary, 6–12 mm diam. *Bracts* 1–3, usually hidden, ovate to elliptic, 0.5–1(1.5) mm long, 0.5–0.7 mm wide. *Sepals* 5, basally connate, elliptic, obtuse; outer sepals 2–4 mm long, 1.2–2 mm wide; inner sepals 3.5–4.5 mm long, 2–2.5 mm wide. *Petals* yellow, obovate, 4–6 mm long, emarginate. *Stamens* 11 arranged in 3 fascicles each of 3 fused stamens and 2 free stamens, 1.8–2.2 mm long; filaments fused for most of their length but one of the 3 longer and held inwards; anther oblong to obovate with the tip slightly incurved, apex often dilated after anthesis, 0.8–1.2 mm long; staminodes absent. *Carpels* 3, globular to ellipsoid, 0.6–0.7 mm long; style 1–1.5 mm long; ovule 1 per carpel. *Fruiting carpels* obovoid-ellipsoid, 1.8–2 mm long, 1–1.3 mm wide; seed brown, ellipsoid, 1.5 mm long and 1–1.3 mm wide, with a white basal aril. (Figure 3I).

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: 8 miles [13 km] S of Napier River on the Porongurup–Albany road, 15 Sep. 1966, E.M. Bennett 1057; 16 km NNE of Albany off Chester Pass Rd, 5 Oct. 1976, R.J. Chinnock 3237 (duplicate AD *n.v.*); Keith Rd, Hay River off Denmark road east of Denmark, 19 Nov. 1980, E.J. Croxford 1109; Chorkerup Rd, off Hay River Rd Narrikup, 10 Aug. 1984, E.J. Croxford 3344A; King George Sound, Oct. 1898, Col. Goadby B2594; near Kalgan along Bremer Bay road, c 11 miles [18 km] NE of Albany, 23 Oct. 1971, R.D. Hoogland 12190 (duplicates CANB, HBG, K, L, UC, US all *n.v.*); eastern side of pitcher plant swamp, opposite Allembie Park cemetery, Bayonet Head, Albany, 25 July 1985, E.R. Knight *s.n.*; Two Peoples Bay, 10 Sep. 1971, S. Paust 450; Albany, Plantagenet District, 21 Dec. 1840, L. Preiss 2163; Lower King, NE of Albany, Bonaccord Rd, 25 Sep. 1986, J.R. Wheeler 2451 (duplicates AD, NSW).

Distribution. Western Australia, South West Botanical Province, IBRA regions of Jarrah Forest. Recorded from the Albany area extending between Hay River and Two Peoples Bay and north to Narrikup. (Figure 6C).

Habitat. Occurs on sand or loam, sometimes on the margin of seasonally inundated areas in sheoak or banksia-eucalypt woodland and shrubland.

Phenology. Flowers recorded July to November; fruits recorded November.

Conservation status. Although restricted in distribution it is not thought to be endangered.

Etymology. From the Latin *crassus* – thick and *nervius* – nerved, referring to the prominent thickened midvein of the leaves.

Affinities. Differs from *Hibbertia pulchra* var. *pulchra* in its leaf shape and its much smaller inconspicuous bracts. Differs from *H. hemignosta* in its narrow marginal flat leaf lamina each side of the broad thickened midrib and also in its smaller somewhat truncate anthers.

Note. Previously known by the phrase name *Hibbertia* sp. Stirlings (J.R. Wheeler 2453).

7. *Hibbertia rupicola* (S. Moore) C.A. Gardner, Enum. Pl. Austral. Occ. 83 (1931). – *Candollea rupicola* S. Moore, J. Linn. Soc. Bot. 45: 163 (1920). *Type:* Bruce Rock, Western Australia, Stoward 430 (*holo:* BM).

Hibbertia teretifolia var. *bisulcata* F. Muell., Fragm. Phyt. Austral. 11: 95 (1880). *Type:* Champion Bay, [Western Australia], C. Gray (*lecto:* MEL 666841, here designated). *Excluded syntypes:* Irwin River, [Western Australia], F. Mueller (MEL 666842); a second excluded syntype (Cape Arid, Maxwell) = *H. hamata*.

Shrub to 0.7(1) m high; branchlets glabrescent, hairy when young. *Leaves* densely clustered on short axillary shoots which are spirally arranged on the branchlets, sessile, linear, (2)3–15(20) mm long, 0.4–0.7 mm wide, glabrous, margins tightly revolute to the midrib, apex a short recurved point. *Flowers* terminating short shoots, 8–14 mm diam., subsessile to shortly pedunculate with the peduncle up to 5 mm long; *bracts* inconspicuous and subulate to leaf-like or apparently absent, 1 or 2 usually present on the peduncle when present. *Sepals* 5, elliptic, thin, glabrous, rarely with a few sparse cilia; outer sepals: body 3–4 mm long, 1.5–2 mm wide; apex long-caudate, 1.5–3 mm long; inner sepals: body 3.5–6.5 mm long, 2.5–3.5(4) mm wide; apex shortly caudate, 0.5–1 mm long. *Petals* 5, yellow, obovate, 5–10 mm long, shallowly emarginate. *Stamens* 9–17, in 3 fascicles of 3–6 stamens and also with 2 single stamens, or in 5 fascicles of 2–6 stamens, 2.5–3.5 mm long; filament (1)1.5–2.5 mm long, the fascicles usually fused for half to three-quarters of their length; anther narrowly oblong-elliptic, (1)1.3–2 mm long, occasionally some anthers shrivelled and probably sterile. *Carpels* 3, more or less globular, 1–1.5 mm diam., glabrous; ovule 1 per carpel; style 1.5–4 mm long. *Fruiting carpels* obovoid, 2.5–2.8 mm long, 1.7–2 mm wide; seed brown, globular to broadly ellipsoid, 1.5–1.7 mm long, with a greatly divided white waxy aril extending half the length of the seed. (Figure 4G)

Selected specimens examined (all PERTH except where indicated). WESTERN AUSTRALIA: 25 km E of North Bannister, 5 Dec. 1996, R. Davis 1601; Mt Churchman, 17 Oct. 1966, C.A. Gardner 19004; 33 km W of Three Springs on the Three Springs–Dongara road, near Mooladarra Spring, 8 Nov. 1978, E.A. Griffin 1510; c. 17 miles [27 km] E of Pithara, along road to Kalannie, 28 Sep. 1971, R.D. Hoogland 12037; c. 19 miles [30 km] N of Hopetoun along Ravensthorpe Rd, 7 Oct. 1971, R.D. Hoogland 12087; c. 13 miles [21 km] ESE of Dumbleyung, 9 Oct. 1971, R.D. Hoogland 12100; Wattle Rocks, c. 21.5 km NE on Mt Holland track from Hyden–Norseman road, 17 Oct. 1995, B.J. Lepschi 2165; Toompup Rd South, c. 5 km from junction of Gnowangerup–Jerramungup road, 2 Oct. 1986, J.R. Wheeler 2509; Moorine Rocks, N of Moorine Rock townsite, 22 Sep. 1988, J.R. Wheeler 2605; Ashdale Rd river crossing (tributary of Lort River), 2.4 km E of Beltana Rd, 16 Oct. 1984, S. Wheeler 11.

Distribution. Western Australia, South West Botanical Province, IBRA regions of Geraldton Sandplain, Swan Coastal Plain, Jarrah Forest, Avon Wheatbelt, Roe and Esperance Plains and the Eremaean Province IBRA region of Coolgardie. Widespread extending from just north of Geraldton south east to the south coast and inland to Diemals, Moorine Rock and Ravensthorpe. (Figure 2C).

Habitat. Occurs in woodland, mallee, shrubland or heath on sandy, lateritic, loam or clay soils, occasionally associated with rocky outcrops.

Conservation status. Widespread and not considered endangered.

Affinities. Closely related to *Hibbertia hibbertioides* from which it differs in the apparent 2-grooved undersurface of the leaf indicating the tightly revolute leaf margins and also in its stamens where there is a greater degree of fusion of the filaments of each fascicle. The stamens are also more variable in number than in *H. hibbertioides*. Also closely related to *Hibbertia hamata* from which it differs in its straight rather than recurved leaves with more tightly revolute leaf margins (see note under that species).

Note. Of the three syntypes of *Hibbertia teretifolia* var. *bisulcata*, only two of them that of Gray and that of Mueller match the original description. The Gray specimen from Champion Bay is chosen as the lectotype as it is more complete. The Cape Arid specimen of Maxwell is excluded as belonging to *H. hamata*.

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Miscellaneous new *Hibbertia* species (Dilleniaceae) from the south coast and adjacent interior of Western Australia

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Abstract

Wheeler, J.R. Miscellaneous new *Hibbertia* species (Dilleniaceae) from the south coast and adjacent interior of Western Australia. *Nuytsia* 15(2): 299–310 (2004). Five new species of *Hibbertia* Andr. are formally described. *Hibbertia oligantha* J.R. Wheeler, *Hibbertia pachyphylla* J.R. Wheeler, *Hibbertia papillata* J.R. Wheeler, *Hibbertia psilocarpa* J.R. Wheeler and *Hibbertia turleyana* J.R. Wheeler all from the south coast area of the South-West Botanical Province (Esperance Plains region and Mallee region) with two species extending to the southern Eremaean Province (Coolgardie region). All species are mapped and the three having conservation priority are illustrated.

Introduction

This is one of a series of papers updating the taxonomic knowledge of the genus *Hibbertia* Andr. Following detailed examination of the PERTH collections of *Hibbertia* several new taxa were circumscribed. This paper follows a previous one dealing with a miscellany of taxa from the wheatbelt and pastoral areas of the state (Wheeler 2002) and validates new names from the south coast and adjacent interior. The species are all characterised by having unilateral stamens and belong to either section *Pleurandra* (Labill.) Benth. which typically lack staminodes, or to section *Hemipleurandra* Benth., typically with staminodes (Bentham 1863).

Three of the new species, *Hibbertia pachyphylla*, *Hibbertia papillata* and *Hibbertia turleyana* are currently included on the Department of Conservation and Land Management list of species with conservation priority, being restricted in distribution and in need of further surveying. The response from all of the species to attack by *Phytophthora* remains to be documented.

Taxonomy

Hibbertia oligantha* J.R. Wheeler, *sp. nov.

Hibbertiae andrewsianae affinis sed folliis longis saepe aliquantum acutis costa ut in acumen obtusum extensa, floribus sessilibus vel subsessilibus, flore cum bracteo lineari instructo.

Typus: railway reserve, 100 metres N of Speddingup East Rd, Western Australia, 33 30' S, 121 46' E, 15 October 1984, S. Wheeler 3 (*holo*: PERTH 03033848; *iso*: AD, CANB, K, MEL).

Shrub to 0.5 m high; branchlets usually puberulous. *Leaves* spirally arranged, erect to spreading, often slightly recurved towards the tip, subsessile to shortly petiolate, somewhat glaucous, linear, 3.5–15 mm long, 0.6–1 mm wide, upper surface smooth to slightly tuberculate, glabrous to hairy with short forward pointing simple to semi-stellate hairs, thick, with the leaf margin recurved to a level or very slightly protruding midrib, the new apparent margin rounded, apex obtuse to acute with a blunt mucro. *Flowers* solitary, terminating axillary shoots, sessile to subsessile, often sparse; *bract* below flower leaf-like or hidden amongst the upper leaves, linear, c. 1.5 mm long, acute. *Sepals* 5, elliptic, 4.5–6 mm long, mostly glabrous, midrib not prominent; outer sepals acute, occasionally with 1 or 2 hairs at the apex; inner sepals slightly broader, sub-acute to obtuse. *Petals* 5, yellow, obovate, 4–7.5 mm long, emarginate. *Stamens* 6–10, all on one side of the carpels, fused only basally, usually equal in length; filament 0.5–1.5 mm long; anther oblong, 1.5–2 mm long, obtuse, dehiscing by longitudinal slits. *Staminodes* absent. *Carpels* 2, globular, glabrous; style divergent, c. 3 mm long. *Ovules* 2 per carpel. *Fruiting carpels* not seen.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: N of Gibson Soak, 5 Nov. 1962, J.S. Beard 2332; Truslove, between Salmon Gums and Esperance, 15 Oct. 1931, W.E. Blackall 1038; Esperance–Kalgoorlie 547 mile peg, 13 Jan. 1972, H. Demarz D3640; c. 7 miles [11 km] S of Grass Patch along Norseman–Esperance highway, 2 Oct. 1971, R.D. Hoogland 12051 (duplicates CANB, HBG, K, L, UC, US, all *n.v.*); powerline right-of-way on the W side of Coolgardie Esperance highway at the SW corner of junction with Jenkins St, in Gibson, 26 Sep. 2001, J.W. Horn 4136 (duplicate DUKE, *n.v.*); Remnant vegetation northern boundary Loc. 1878; 21 Sep. 1998, E.M. Sandiford 137; 6 km NW of Peak Charles towards Norseman, 20 Sep. 1979, J. Taylor, M.D. Crisp & R. Jackson JT697; 20 km N of Esperance and 8.5 km E on Blumanns Rd on north side of road, 26 Sep. 2001, J.R. Wheeler 4114; 20 km N of Esperance, Blumanns Rd, 1.2 km S of right angle bend on Blumanns Rd, 26. Sep. 2001, J.R. Wheeler 4119; tributary of Young River, c. 80 km W of Esperance, 28 Sep. 1968, P.G. Wilson 8049.

Distribution. Western Australia, South West Botanical Province, IBRA regions (Thackway & Cresswell 1995) of Esperance and Mallee. Recorded between Peak Charles, the South Coast west of Esperance and just north of Esperance. (Figure 1A).

Habitat. Recorded from sandy soil in heath.

Phenology. Flowers mostly September–November.

Conservation status. Poorly known, but not currently believed to be under immediate threat.

Etymology. From the Greek *oligos* – few, small, little and *anthos* – flowers, referring to the relatively few flowers on many specimens.

Affinities. Probably most closely related to *Hibbertia andrewsiana* Diels, differing however in its longer leaves, often somewhat acute and with the midrib extended as a blunt point and also in its sessile to subsessile flowers each with a narrower linear bract.

Differs from *Hibbertia psilocarpa* in the less swollen midrib of the lower surface of the leaves; its bracts, which are narrow, leaf-like and acute; its sepals which are more acute and often with a few hairs

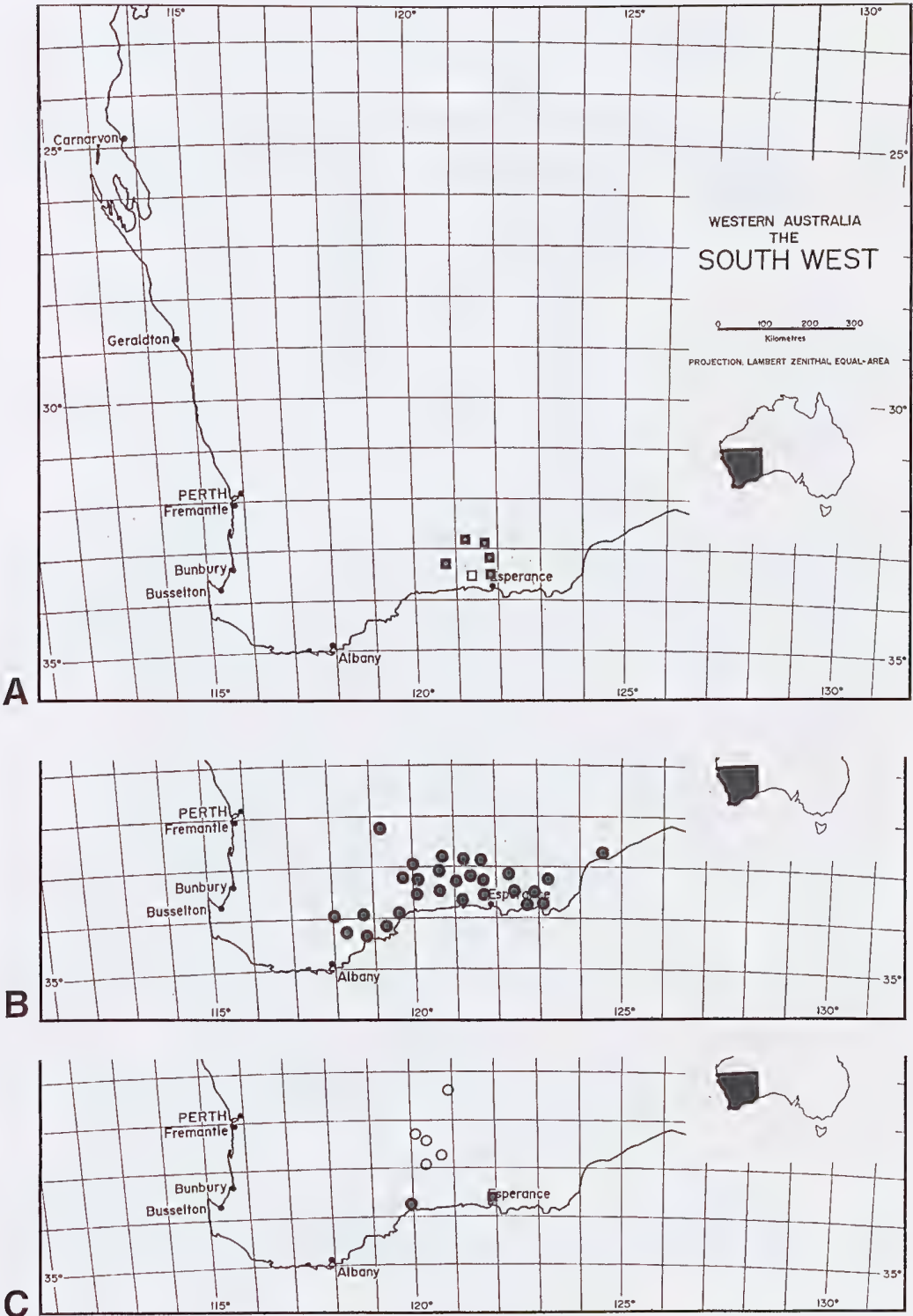


Figure 1. A. *Hibbertia oligantha* ■, intermediate between *Hibbertia oligantha* and *Hibbertia psilocarpa* □. B. *Hibbertia psilocarpa* ●. C. *Hibbertia pachyphylla* ○, *Hibbertia papillata* ●, and *Hibbertia turleyana* ■.

at the apex; the number of ovules per carpel. The hairs of the hairy variant of *Hibbertia oligantha* are quite different from those of the hairy variant of *Hibbertia psilocarpa* being antrorsely directed.

Note. Several specimens from the Gibson-Truslove area (*R.D. Hoogland* 12051, *W.E. Blackall* 1038) are distinctly hairy, the upper leaf surface more tuberculate than usual and the apex a little recurved. The sepals also have minute appressed simple hairs on their upper half. Otherwise these specimens appear to fit with the remainder of the collections.

Hibbertia pachyphylla* J.R. Wheeler, *sp. nov.

Quoad dispositionem staminum et staminodiorum *H. charlesii* accedit, sed ab ea differt foliis brevioribus et latoribus, costa minus tumida, et sepalis parvioribus pilis magis appressis.

Typus: 305 mile peg on Norseman–Hyden road, Western Australia, 7 September 1973, *E.C. Nelson* 17331 (*holo:* PERTH 04435338; *iso:* CANB)

Shrub to 0.5 m high; branchlets with glabrous ridges below the leaf bases, usually with an indumentum of tiny curled hairs but glabrescent. *Leaves* spirally arranged, greatly spreading to reflexed, sessile to subsessile, varying from broadly oblong-elliptic to narrowly oblong, 2–6(11) mm long, 1.5–2.2 mm wide, very thick to sub-terete, the leaf margin tightly recurved to the midrib, the midrib hidden or level with the recurved margin, lower surface (1)2-grooved, upper surface smooth to distinctly tuberculate but glabrous apart from young leaves which may have curled hairs at least at their base, apex somewhat recurved and obtuse but pungent with a straight but downturned mucro. *Flowers* solitary, terminating short shoots, usually sessile, 10–12 mm diam.; *bracts* below flower narrowly triangular, 1–3 mm long, acute, with grey to brown curled hairs. *Sepals* 5, elliptic, 5–6(7) mm long, with grey to brown somewhat appressed and mostly straight simple hairs, midrib not prominent, usually obtuse; outer sepals *c.* 3 mm wide; inner sepals 4–5(6) mm wide with thinner broad glabrous margins. *Petals* 5, yellow, obovate, 6–9 mm long, deeply emarginate. *Stamens* 5, all on one side of the carpels and basally fused, usually equal in length; filament *c.* 0.5 mm long; anther narrowly oblong, 2–3 mm long, obtuse, dehiscing by longitudinal slits. *Staminodes* 5–7 outside of the stamens, occasionally up to 11 and both outside and each side of the stamens, elliptic, 1.5–2 mm long. *Carpels* 2, globular, densely white-hairy; style erect, *c.* 1.5 mm long. *Ovules* 4(5) per carpel. *Fruiting carpels* not seen mature. (Figure 2A–C).

Other specimens examined (all PERTH). WESTERN AUSTRALIA: 33 km E of Forrestania crossroads *c.* 118 km E of Hyden on Hyden–Norseman road, 17 Oct. 1984, *J.M. Brown* 210; SW of Queen Victoria Rocks, 17 Sep. 1966, *A.S. George* 8047 (duplicate AD); 51.2 km E of Forrestania crossroads on Hyden–Norseman road, 4 Nov. 1988, *T.D. Macfarlane* 1856; 20 km SW of Round Top Hill, *c.* 140 km W of Norseman, 3 Nov. 1979, *K.R. Newbey* 6249; 2 km NW of 90 mile tank, Norseman–Lake King road, 12 Nov. 1979, *K.R. Newbey* 6492; 42 km NE of Swallow Rock, Frank Hann National Park, *c.* 83 km NE of Lake King, 1 Aug. 1980, *K.R. Newbey* 6841.

Distribution. Western Australia, South West Botanical Province, IBRA region of Mallee and also the Eremaean Province, IBRA region of Coolgardie. Scattered localities only between Queen Victoria Rocks and Frank Hann National Park. (Figure 1C).

Habitat. Occurs on sand in open mallee woodland, or scrub with scattered shrubs and *Triodia* species.

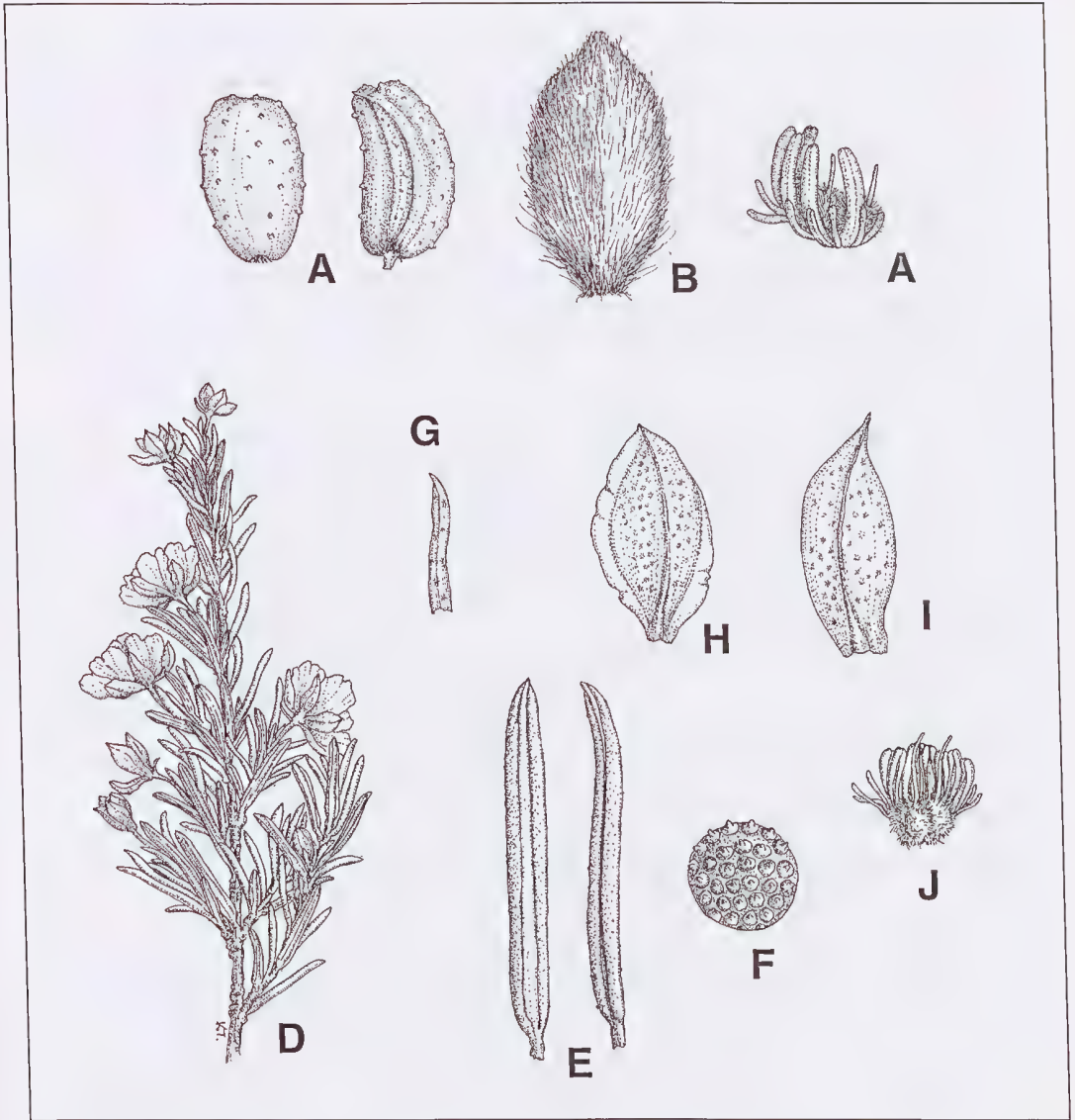


Figure 2. A–C *Hibbertia pachyphylla*, drawn from E.C. Nelson 17331. A– leaf, both surfaces (x8); B– sepal (x8); C– stamens, staminodes and carpels. D–J *Hibbertia papillata*, drawn from K.R. Newbey 111100 and J.R. Wheeler 4099. D– flowering branch (x2), E– leaf, both surfaces (x8), F– detail of leaf surface (x20), G– bract (x8), H– inner sepal (x8), I– outer sepal (x8), J– stamens and carpels (x8).

Phenology. Flowers recorded September–November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three, with need for further survey work.

Etymology. From the Greek *pachy* – thick and *phylla* – leaf, referring to the thick and often quite short leaves of the species.

Affinities. *Hibbertia pachyphylla* is a somewhat variable taxon, apparently related to *H. charlesii* J.R. Wheeler which has the same number of stamens and also several staminodes occurring outside of the stamens. This unusual arrangement of stamens and staminodes and the subsequent difficulty in placing such taxa within the current sectional framework of the genus has already been noted for *H. charlesii* (Wheeler 2000). *Hibbertia charlesii*, which is recorded only from granitic soils of Peak Charles, differs from *H. pachyphylla* in its much longer linear leaves with an enlarged midrib and its longer, distinctly mucronate sepals.

Some of the collections (*E.C. Nelson* 17331, *K.R. Newbey* 6249, *T.D. Macfarlane* 1856) are similar in appearance to *Hibbertia microphylla* Steud. with similarly shaped thick leaves. They differ, however in indumentum, pungent leaf apex, absence of peduncle, sepal shape and indumentum, stamen number and ovule number.

Notes. The available collections show considerable variation in their leaves. The leaves are commonly broadly oblong to broadly elliptic, but several are longer and narrowly oblong in shape (*J.M. Brown* 210, *K.R. Newbey* 6841). Some collections have the leaf margins recurved to such an extent that there is only a single groove on the apparent lower leaf surface (*A.S. George* 8047, *K.R. Newbey* 6841). A collection from Frank Hann National Park (*K.R. Newbey* 6841) has sub-terete leaves rather than somewhat flattened leaves with only a hint of a single groove. The most northerly collection from Queen Victoria Rocks (*A.S. George* 8047) is unusual in having up to 11 staminodes, occurring both outside and to each side of the fertile stamens. The sepals are usually obtuse, but the outer sepals are occasionally sub-acute (*A.S. George* 8047, *K.R. Newbey* 6841). One collection (*J.M. Brown* 210) has subsessile rather than sessile flowers. Additional future collections, may shed more light on these differences and may allow circumscription of infraspecific taxa.

Hibbertia papillata* J.R. Wheeler, *sp. nov.

Hibbertia lineata et *H. recurvifolia* affinis sed pagina superiore folii minute papillosa, foliis margine rotundatis, pilis carentibus ab apice foliorum, et costa folii minus prominenti.

Typus: Fitzgerald River National Park, SE slopes of East Mt Barren, Western Australia, 33 55' S, 120 0' E, 23 September, 1986, *J.R. Wheeler* 2428 (*holo:* PERTH 03034275; *iso:* AD, CANB, K, MEL, NSW)

Shrub to 0.5 m high; branchlets minutely stellate-hairy. *Leaves* spirally arranged, often spreading and usually slightly recurved towards the leaf apex; petiole 0.5–1 mm long, densely minutely stellate-hairy; blade linear but thick with the margins revolute to the midrib, 6–11 mm long, c. 1 mm wide, upper surface glabrous apart from numerous minute papillae, the apparent leaf margin rounded, lower surface usually hidden but having dense white stellate hairs, midrib glabrous and not swollen, apex obtuse with a short blunt mucro. *Flowers* solitary, axillary, 10–12 mm diam., pedunculate; *peduncle* 3–7 mm long, with minute sparse stellate hairs; *bract* immediately below flower linear to subulate, 1.5–6 mm long, with minute sparse stellate hairs, acute; bracts at base of peduncle similar. *Sepals* 5, elliptic, 3.5–6 mm long and 2–2.5 mm wide, midrib fairly prominent, outer surface with minute sparse stellate hairs, the inner surface sparsely woolly towards apex, sub-acute to acute; inner sepals more obtuse and slightly broader than the outer sepals, the margin thinner and more or less glabrous. *Petals* 5, yellow, obovate, 4.5–7.5 mm long, emarginate. *Stamens* 8–10, all on one side of the carpels and basally fused, usually equal in length; filament 1–1.5 mm long; anther oblong, 1–1.5 mm long, obtuse, dehiscing by longitudinal slits. *Staminodes* 3 or 4 on each side of the stamens and occasionally 1 or 2 continued behind

the stamens, linear to narrowly elliptic, 0.5–1 mm long. *Carpels* 2, globular, densely stellate-hairy; style more or less erect, 1.5–2 mm long. *Ovules* 2 per carpel. *Fruitlets* not seen mature, immature fruitlets obovoid and c. 2 mm high and c. 1.5 mm wide. (Figure 2D–J).

Other specimens examined (all PERTH). WESTERN AUSTRALIA: Eyre Range, 2 Nov. 1965, A.S. George 7262; SE slope of East Mt Barren, 7 Oct. 1971, R.D. Hoogland 12079 (duplicates BR, CANB, K, L, UC, US, all *n.v.*); S facing slope of East Mt Barren, Fitzgerald River National Park, 29 Sep. 1999, J.W. Horn 2676 with R. Butcher (duplicate DUKE, *n.v.*); on S side of East Mt Barren, 1 Oct. 1970, B.R. Maslin 905; on S side of East Mt Barren, 1 Oct. 1970, B.R. Maslin 905a (duplicate CANB *n.v.*); no locality, 3 Sep. 1986, K.R. Newbey 11110; Fitzgerald River National Park, lower slopes of East Mt Barren, 22 Sep. 1986, J.R. Wheeler 2426 (duplicates CANB, MEL); Fitzgerald River National Park, SW slopes of East Mt Barren, 300 m up walk track to the summit, 8 Sep. 2001, J.R. Wheeler 4099 (duplicates AD, BRI, CANB); East Mt Barren, c. 8 km W of Hopetoun, 4 Oct. 1966, P.G. Wilson 5447; East Mt Barren, 4 Oct. 1966, P.G. Wilson 5469 (duplicate K).

Distribution. Western Australia, South West Botanical Province, IBRA region of Esperance Plains. Recorded from the Eyre Range and East Mt Barren only. (Figure 1C).

Habitat. Recorded from low heath on quartzite ridges, with *Regelia velutina*, *Hakea victoriae*, *Pimelea physodes* and *Banksia* species.

Phenology. Flowers recorded for September to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. Restricted in distribution, known only from two populations but from within a National Park.

Etymology. From the Latin *papillatus* – having papillae, referring to the minute papillae on the upper surface of the leaves.

Affinities. *Hibbertia papillata*, with stamens all on one side of 2 carpels and the presence of staminodes, belongs in section *Hemipleurandra* Benth. It is probably most closely related to *Hibbertia recurvifolia* Benth. and *Hibbertia lineata* Steud., but differs in leaf shape, the texture of the leaf surface and absence of apical hairs at the leaf apex as well as having shorter peduncles. *Hibbertia recurvifolia* and *H. lineata* both have usually slightly broader and slightly flattened thick leaves with somewhat scabrous apparent margins recurved to a more swollen midrib. Their leaves have a somewhat recurved apex, often with a few straight apical hairs.

Note. Previously known by the phrase name *Hibbertia* sp. papillose leaves (K.R. Newbey 11110).

Hibbertia psilocarpa* J.R. Wheeler, *sp. nov.

Hibbertiae oliganthae affinis sed costa folii tumida, floribus plus numerosis, bracteis ovatis et obtusis, ovulis 3–8 per carpellum differt.

Typus: Ravensthorpe–Hopetoun road, Western Australia, 33 45' S, 120 4' E, 22 September 1986, J.R. Wheeler 2422 (*holo*: PERTH 03033457; *iso*: AD, K)

Shrub to 0.7(1) m high, often somewhat glaucous; branchlets glabrous or puberulous. *Leaves* spirally arranged, antrorsely directed and often somewhat incurved, subsessile to shortly petiolate (petiole to 0.8 mm long), narrowly oblong to linear, (1.5)3–11 mm long, 0.6–1.2 mm wide, thick to almost semi-terete with the margin revolute to a swollen and protruding midrib, the new apparent margin rounded, glabrous or puberulous with short erect hairs, apex obtuse. *Flowers* solitary, axillary or terminating short shoots, (8)10–12 mm diam., sessile to pedunculate with peduncles up to 10 mm long. *Bracts* several below the flower in sessile flowers or at the base of the peduncle, or frequently scattered up the peduncle, narrowly ovate to ovate, 0.5–1 mm long, often ciliolate, acute to obtuse. *Sepals* 5, elliptic, 4–7 mm long, glabrous, midrib not prominent; outer sepals narrower and obtuse to acute; inner sepals broader and obtuse. *Petals* 5, yellow, obovate, 4.5–7 mm long, very shallowly emarginate to more or less obtuse. *Stamens* 4–8(10), all on one side of the carpels and scarcely basally fused, often variable in length within each flower; filament 1–2 mm long; anther narrowly oblong to oblong, 1.5–3 mm long, obtuse, dehiscent by longitudinal slits. *Staminodes* absent, but occasionally one of the stamens may be malformed. *Carpels* 2, obovoid, glabrous; style more or less erect, 2–3 mm long. *Ovules* (3)4–6(8) per carpel. *Fruiting carpels* not seen mature.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: 7 miles [11 km] SW of Mt Ragged, 19 Oct. 1970, T.E.H. Aplin 4303; 24.3 km due SSE of Peak Eleanora, 7.96 km N of Rolland Rd on Fields Rd, 28 Sep. 1984, M.A. Burgman 3823; 19.5 km due SE of Muckinwobert Rock, 4.5 km W of West Point Rd on Rawlinson Rd, 1 Oct. 1984, M.A. Burgman 4028; 114 km S of Balladonia, 19 Aug. 1995, R.J. Cranfield 10144; along Ravensthorpe–Esperance road, c. 4 miles [6.5 km] W of Lort River, 5 Oct. 1971, R.D. Hoogland 12074; Kumarl, between Norseman and Esperance, Aug. 1938, L.A. Horbury 74; 31 km ENE of Lake King, Frank Hann National Park, 31 July 1980, K.R. Newbey 6819; 73 km E of Jerramungup on Jerramungup–Ravensthorpe road, 6 Aug. 1974, G. Perry 130; 22.5 km E of Mt Madden crossroads, next to Location 2818, (E of Lake King), 7 Aug. 1968, R.A. Saffrey 301; Fitzgerald River National Park, Pabelup Drive, 11.6 km NW of junction with Point Ann Rd, 8 Sep. 2001, J.R. Wheeler 4095.

Distribution. Western Australia, South West Botanical Province, IBRA regions of Esperance and Mallee and also Eremaean Province, IBRA region of Coolgardie. Apparently widespread from north of Hyden to Fitzgerald River National Park extending west to Ongerup and east to Israelite Bay. (Figure 1B).

Habitat. Grows most commonly on sandy, clayey or gravelly soils, from a variety of habitats, heath, shrubland and mallee, but also from paperbark or yate swamps.

Phenology. Flowers recorded May to November, but most commonly flowering July to October.

Conservation status. Widespread, not considered under threat.

Etymology. From the Greek *psilos* – bare, stripped of hairs, smooth and *carpos* – fruit, referring to the prominent glabrous carpels.

Affinities. Differs from *Hibbertia oligantha* in having a more swollen midrib on the lower leaf surface. The hairs of the hairy variant are very short and erect (at right angles to the leaf surface). There are 3 or 4 bracts at the base of the flower or scattered up the peduncle, which are ovate, ciliolate and obtuse unlike those of *H. oligantha* which are linear, leaf-like and more or less acute. The sepals are usually more obtuse than those of *H. oligantha*. *Hibbertia psilocarpa* also differs in having 3–8 ovules per carpel, but most commonly 4 or 5.

Differs from *Hibbertia gracilipes* Benth., with which it has sometimes been confused, in its dull and often somewhat glaucous obtuse leaves, usually fewer stamens with larger and obtuse anthers, glabrous carpels with more numerous ovules and longer styles. *Hibbertia gracilipes* has shiny leaves with the midrib extending very slightly as a blunt point, 10–12 stamens with anthers up to 1.5 mm long and distinctly apiculate, hairy or partially hairy carpels with styles usually only 1–1.5 mm long.

Notes. Previously known by the phrase name *Hibbertia* sp. Esperance (A. Burgman 1055 & S. McNee). A variable species varying in the presence or absence of puberulous indumentum and also between sessile and long-pedunculate flowers. There appears to be a gradual gradation between the glabrous variant and the puberulous variant which does not allow for easy separation into two subspecific taxa. The long-pedunculate variants seem to occur most commonly in the glabrous variants. The species is also variable as to stamen number, 4–10 and to ovule number, 3–8 but most commonly 4 ovules per carpel.

A few specimens (A.E. Orchard 1540 and 1544 from Stokes Inlet, also H.D. Hoogland 12069 and J.R. Wheeler 4120 and 4121 from just east of Stokes Inlet) appear to be intermediate between *H. oligantha* and *H. psilocarpa*. (Figure 1A).

Hibbertia turleyana J.R. Wheeler, *sp. nov.*

Hibbertia ulicifolia affinis sed in habito, in foliis sparsioribus et minus rigidis, et in forma et indumento sepalorum differt; ab *H. hamulosa* in forma folii et in indumento sepalorum differt.

Typus: Helms Arboretum, c. 16 km N of Esperance on the Coolgardie–Esperance Hwy, Western Australia, 33°43' S, 121°49' E, 4 September 2000, J.R. Wheeler 4056 (*holo:* PERTH 06458092; *iso:* AD, CANB, K, MEL, NSW)

Shrub to 0.3 m high, multi-stemmed and open; branchlets glabrous or with sparse stellate hairs. *Leaves* distant, alternate to spirally arranged, occasionally in loose clusters; petiole 0.5–1 mm long, minutely stellate-hairy; blade linear, 10–25 mm long, 0.8–1.3 mm wide, thick, glabrous apart from scattered stellate hairs when young, the margin recurved to the midrib, midrib more or less level with and not greatly protruding beyond the level of the recurved leaf margin, apex a pungent mucro 0.5–1.2 mm long. *Flowers* axillary, solitary or occasionally 2 per axil, 10–15 mm diam.; *peduncle* reddish, 6–15 mm long, stellate-hairy; *bract* immediately below flower very narrowly ovate, 1–1.8(2) mm long, densely stellate-hairy, shortly pungent. *Sepals* 5, 5–6(7) mm long, outer surface stellate-hairy, inner surface minutely woolly-stellate in the upper half, midrib not prominent, apex with a short mucro up to 0.5 mm long; outer sepals ovate-elliptic, 2–3 mm wide, shortly acuminate; inner sepals broadly elliptic, 3–4 mm wide, the thinner margin glabrous and ciliolate, more or less obtuse. *Petals* bright yellow, obovate, 5–8(10) mm long, shallowly to deeply emarginate. *Stamens* (8)9 all on one side of the carpels and basally fused, usually equal in length; filament 1–1.5 mm long; anther oblong, c. 1.5 mm long, dehiscing by longitudinal slits. *Staminodes* absent. *Carpels* 2, globular, c. 1 mm diam., densely white-hairy; style erect but curved towards the tip, 1.5–2 mm long. *Ovules* 2 per carpel. *Fruiting carpels* obovoid, c. 3.5 mm long and c. 2 mm wide, stellate-hairy. *Seeds* brown, globular, c. 2 mm diam., with a white waxy basal aril. (Figure 3).

Other specimens examined (all PERTH). WESTERN AUSTRALIA: Gibson Soak, 10 Aug. 1951, N.H. Brittan s.n.; Gibsons Soak, 4 Sep. 1962, C.A. Gardner 14165; Gibson, 10 Aug. 1951, R.D. Royce 3589; Speddingup East Rd, 1 Aug. 1994, C.D. Turley 1/894; Helms Arboretum, 4 Aug. 1996,

C.D. Turley 1/198; Helms Arboretum, 17 Sep. 1999, *C.D. Turley* 11/999 (duplicate AD); cultivated plant ex Helms Arboretum 19 Sep. 1999, *C.D. Turley* 11B/999 (duplicate MEL); Helms Arboretum, 20 Sep. 2000, *C.D. Turley* 92000 (duplicates AD, K); Helms Arboretum, c. 16 km N of Esperance on the Coolgardie–Esperance Hwy, 5 Sep. 2000, *J.R. Wheeler* 4061.

Distribution. Western Australia, South West Botanical Province, IBRA region of Esperance Plains. Apparently restricted to a small area just north of Esperance. (Figure 1C).

Habitat. Recorded from sandy soil which may be seasonally inundated in banksia heath or mallee shrubland.

Phenology. Flowers recorded for August and September; fruits recorded for September.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One. Apparently restricted to a very few populations.

Etymology. Named after Coral Turley of Esperance, wildflower enthusiast with an exceptional knowledge of the plants of the Esperance area, in appreciation of her assistance.

Affinities. *Hibbertia turleyana* clearly belongs to section *Pleurandra* and is an additional species for the *Hibbertia mucronata* group (Wheeler 2000). It is most closely related to *H. ulicifolia* (Benth.) J.R. Wheeler and *H. hamulosa* J.R. Wheeler. *Hibbertia ulicifolia* occurs nearby, but in more coastal situations east of Esperance. *Hibbertia hamulosa* occurs to the west, between Bremer Bay and Ravensthorpe.

Hibbertia turleyana differs from *H. ulicifolia* in its more sprawling open habit, its less rigid and more slender sparser foliage, also in its sepal indumentum and shape. *Hibbertia ulicifolia* is characterised by its more crowded rigid leaves spreading at right angles to the stem. The sepal indumentum of *H. ulicifolia* is sparser than that of *H. turleyana* and its sepals have a long-acuminate apex with a longer but less rigid point. The bracts of *H. ulicifolia* are also less hairy than those of *H. turleyana*.

Hibbertia turleyana differs from *H. hamulosa* in leaf shape and sepal indumentum. The leaves of *H. hamulosa* have a more prominent midrib which protrudes beyond the level of the rounded recurved leaf margins and its sepals have a mixture of stellate and uncinat hairs. *Hibbertia hamulosa* has shorter peduncles (2–4 mm long) and somewhat longer subulate bracts (1.5–4 mm long). The stamens are usually fewer, 5–8 in *H. hamulosa*.

Note. Previously known by the phrase name *Hibbertia* sp. Helms Arboretum (*C.D. Turley* 1/198).

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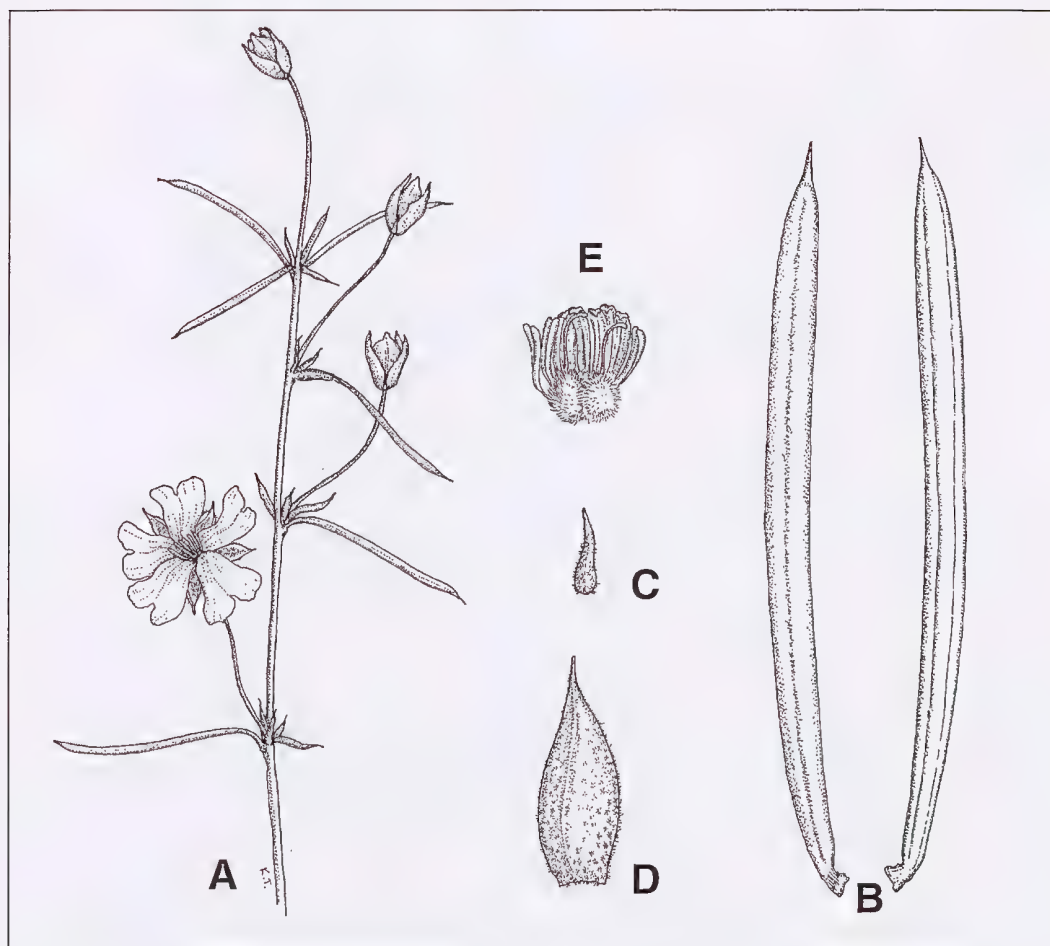


Figure 3. *Hibbertia turleyana*, drawn from C.D. Turley 11B/999 A— flowering branch (x2), B— leaf, both surfaces (x8), C— bract (x8), D— outer sepal (x8), E— stamens and carpels (x8).

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An interim key to the Western Australian species of *Hibbertia* (Dilleniaceae)

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Abstract

Wheeler, J.R. An interim key to the Western Australian species of *Hibbertia* (Dilleniaceae). *Nuytsia* 15(2): 311–320 (2004). A key is presented to the Western Australian species of *Hibbertia* following the formal recognition of numerous new species in recent years.

Introduction

Following a series of papers on the taxonomy of the genus *Hibbertia* Andr. and the publication of many new species and infraspecific taxa (Toelken & Wheeler 2002, Wheeler 2000 a–b, 2002 a–e, 2004 a–c), existing keys to the genus by Bentham (1863) and Grieve (1998) have become out of date. An interim key is provided here prior to the ‘Flora of Australia’ treatment of the family that is still some years away.

Several taxa in the key are referred to only by informal phrase names or are annotated as being variants. Other taxa belong to complexes which are as yet unresolved. *Hibbertia exasperata*, *Hibbertia rostellata*, *Hibbertia nutans* and *Hibbertia uncinata* belong to such an unresolved complex and are all referred to in this key as *Hibbertia exasperata* group.

Key to the genus *Hibbertia* in Western Australia

1. Stamens all on one side of 2 carpels (sometimes some staminodes occur opposite the stamens)
2. Flowers in a several-flowered spike
3. Sepals, bracts and young leaves glabrous or with minute stellate and hooked hairs *H. spicata*
3. Sepals, bracts and young leaves with fairly long coarse simple hairs, sometimes also with underlying minute stellate hairs
4. Hairs white. Stamens few (8–10) in few rows *H. polystachya*
4. Hairs brownish. Stamens many (28–43) in several rows (Kimberley region only) *H. ledifolia*
2. Flowers solitary or clustered in the leaf axils
5. Flowers stalked
6. Carpels hairy or scaly

7. Leaves strongly pungent or gradually tapered and spine-tipped
 8. Sepals with scales or scale-like stellate hairs
 9. Leaf with recurved spiny tip *H. eatoniae*
 9. Leaf with straight spiny tip
 10. Flowers 8–15 mm diam. Upper leaf surface smooth *H. lepidocalyx* subsp. *lepidocalyx*
 10. Flowers 15–25 mm diam. Upper leaf surface tuberculate *H. lepidocalyx* subsp. *tuberculata*
 8. Sepals glabrous or with hairs, not scales
 11. Leaf tip recurved. Carpels 4-ovulate *H. ancistrophylla*
 11. Leaf tip straight, not recurved. Carpels 2-ovulate
 12. Sepals spine-tipped. Plant usually erect
 13. Sepals with dense minute stellate hairs (sometimes also hooked hairs). Leaves not usually spreading as far as 90 degrees to the stem
 14. Midrib of leaf unusually enlarged on lower surface and protruding beyond leaf surface. Peduncle up to 4 mm long. Outer sepals with mucro to 4 mm long
 15. Young branchlets densely woolly. Stamens 5. Sepals without hooked hairs *H. mucronata*
 15. Young branchlets with tiny stellate hairs. Stamens 5–8. Sepals with hooked hairs *H. hamulosa*
 14. Midrib of leaf not unusually enlarged. Peduncle 6–15 mm long. Sepals with mucro up to 0.5 mm long *H. turleyana*
 13. Sepals appearing glabrous but with very sparse and very minute stellate or semi-stellate hairs. Leaves very rigid and usually at 90 degrees to the stem *H. ulicifolia*
 12. Sepals obtuse to acute, not or scarcely spine-tipped. Often a small cushion-like plant *H. acerosa*
 7. Leaves not strongly pungent, but sometimes with a short mucro or a blunt or hair-like point
 16. Leaf tip recurved
 17. Leaf thick, linear, much longer than wide, erect or spreading with tightly revolute margins
 18. Sepals glabrous or almost so, sometimes with sparse minute stellate hairs, midrib of sepal not or only slightly pronounced
 19. Leaves with straight hairs or hooked hairs *H. avonensis*
 19. Leaves glabrous or almost so, or with occasional stellate hairs
 20. Apparent margin of leaf somewhat acute, surface sparsely tuberculate, apex distinctly recurved
 21. Leaf 8–25 mm long *H. lineata*
 21. Leaf 2.5–12 mm long *H. recurvifolia*
 20. Apparent leaf margin rounded, surface very minutely papillose, apex not or only slightly recurved *H. papillata*
 18. Sepals densely stellate-hairy and with pronounced midrib *H. verrucosa*
 17. Leaf ovate, very thick, almost as wide as long, downturned with tightly revolute margins *H. microphylla*
 16. Leaf tip not distinctly recurved
 22. Leaves glabrous or the upper surface glabrous or glabrescent

- 23. Leaves 13–55 mm long, slender, lacking a terminal point.
Stamens 17–25, staminodes several in a row outside the
fertile stamens. (Kimberley region only) **H. hooglandii**
- 23. Leaves 1.5–12 mm long, with a blunt terminal point. Stamens about 10,
sometimes with a few staminodes each side of the fertile stamens
- 24. Sepals glabrous
- 25. Carpels 3 or 4-ovulate. Bracts broadly ovate and cordate. Leaf
margins revolute to a sunken midrib. Staminodes present **H. stenophylla**
- 25. Carpels 2-ovulate. Bracts narrowly oblong to linear or subulate.
Leaf margins revolute to a swollen midrib. Staminodes absent **H. gracilipes**
- 24. Sepals hairy, often minutely so
- 26. Sepals with minute stellate hairs. Upper leaf surface glabrous.
Carpels 2-ovulate **H. papillata**
- 26. Sepals with uncinata and often stellate hairs. Upper leaf
surface with very occasional hooked hairs when young.
Carpels 4-ovulate **H. ancistrotricha**
- 22. Leaves with stellate and/or simple hairs, sometimes with hooked hairs
- 27. Stellate hairs absent, or if present very few
- 28. Flower stalks single
- 29. Carpels 2-ovulate. Staminodes often present, 2 or 3 each side of the
fertile stamens. Sepals glabrous or with simple, straight or uncinata hairs
- 30. Sepals glabrous or with a few appressed hairs. Bract below
flower ovate to broadly ovate **H. avonensis**
- 30. Sepals with uncinata and straight hairs. Bract below
flower linear **H. diamesogenos**
- 29. Carpels 4-ovulate. Staminodes absent. Sepals with
uncinata and stellate hairs **H. ancistrotricha**
- 28. Flower stalks in a dense cluster arising from a cluster of leaves **H. sp. tathra**
- 27. Stellate hairs present, dense but often minute and also often
with longer simple hairs
- 31. Leaves flat, elliptic to obovate
- 32. Leaves with long simple hairs as well as minute stellate hairs
on undersurface **H. silvestris**
- 32. Leaves with stellate hairs and scales only **H. hypericoides** (northern variant)
- 31. Leaves with slightly to strongly recurved margins
appearing linear or narrowly oblong
- 33. All sepals with prominent midrib **H. verrucosa**
- 33. Sepals, at least inner ones without a very prominent midrib
- 34. Leaves 6–25 mm long **H. hypericoides**
- 34. Leaves 20–50 mm long **H. furfuracea**
- 6. Carpels glabrous
- 35. Flower stalks up to 10 mm long, usually straight. Styles 2–3 mm long.
Leaf midrib swollen and protruding on lower surface **H. psilocarpa**
- 35. Flower stalks 10–25 mm long, greatly recurved, more or less sigmoid.
Styles 4–5 mm long. Leaf midrib not swollen **H. andrewsiana**
- 5. Flowers sessile or sub-sessile
- 36. Carpels hairy
- 37. Leaf apex more or less obtuse

- 38. Leaves with sparse but conspicuously long spreading hairs.
 Sepals more or less glabrous **H. sp. Mt. Lesueur**
- 38. Leaves glabrous or with short more or less appressed hairs.
 Sepals glabrous or with short appressed hairs
- 39. Leaves and also sometimes sepals with short hairs **H. crassifolia**
- 39. Leaves and sepals glabrous or with minute stellate to semi-stellate hairs
- 40. Bracts narrowly ovate. Carpels 2-ovulate **H. aurea**
- 40. Bracts broadly ovate and cordate. Carpels 3 or 4-ovulate **H. stenophylla**
- 37. Leaf apex prominently acute or pungent
- 41. Young branchlets woolly. Fertile stamens 5, staminodes absent
 or 5-20 outside the stamens
- 42. Stamens 5, staminodes absent **H. mucronata**
- 42. Fertile stamens 5, staminodes 5-20 outside the stamens **H. charlesii**
- 41. Young branchlets not woolly. Fertile stamens 8-11, staminodes
 absent or a few each side of the stamens
- 43. Midrib of lower leaf surface enlarged, prominent and protruding
 beyond level of the revolute leaf margins
- 44. Leaf apex straight or almost so. Carpels 4(5)-ovulate **H. carinata**
- 44. Leaf apex strongly recurved. Carpels usually 2-ovulate **H. ancistrophylla**
- 43. Midrib of lower leaf surface not unusually enlarged, level with
 or sunken below the level of the revolute leaf margins
- 45. Sepals with simple hairs
- 46. Sepals pilose with long hairs **H. axillibarba**
- 46. Sepals very densely hairy with silky hairs **H. pachyphylla**
- 45. Sepals almost glabrous, sometimes with minute stellate hairs
- 47. Leaves very thick, almost cylindric 4-12 mm long, tip rounded
 but with a short hard spine. Sepals 4-7 mm long **H. stowardii**
- 47. Leaves flat or compressed with recurved margins, mostly
 10-25 mm long and gradually tapered at the tip, acute to
 mucronate. Sepals 6-9 mm long **H. aurea**
- 36. Carpels glabrous
- 48. Midrib of leaf not or scarcely enlarged. Bract linear. Carpels 2-ovulate **H. oligantha**
- 48. Midrib of leaf distinctly enlarged. Bract ovate. Carpels 3-8-ovulate **H. psilocarpa**
- 1. Stamens all around the (2)3-5(15) carpels
- 49. Inflorescence branched and apparently leafless **H. conspicua**
- 49. Flowers solitary or clustered in the leaf axils
- 50. Stamens apparently free or almost so, sometimes fused into a ring at the very base
- 51. Flowers stalked
- 52. Carpels 2 or 3
- 53. Carpels 3, glabrous. (South-west and Pilbara regions)
- 54. Leaves and sepals softly hairy **H. inconspicua**
- 54. Leaves and sepals glabrous
- 55. Leaves slender, 0.5-5 mm wide and tapered at base, not surrounding the stem
- 56. Flowers orange or yellow. Stamens 10-15. Leaves linear,
 15-25 mm long **H. stellaris**
- 56. Flowers yellow. Stamens very numerous. Leaves very narrowly
 elliptic, 40-70 mm long **H. glaberrima**
- 55. Leaves 5-15 mm wide, oblong, not tapered at base but
 surrounding the stem. **H. nymphaea**

- 53. Carpels 2 or 3, covered with tiny scales. (Kimberley region)
 - 57. Carpels 3. Sepals scaly, the margin fringed with pale or dark hairs *H. echiifolia*
 - 57. Carpels 2. Sepals scaly, sometimes fringed
 - 58. Leaves folded lengthwise *H. lepidota*
 - 58. Leaves flat
 - 59. Low shrub with indumentum of fringed scales *H. sp. A* (Kimberley Flora)
 - 59. Shrub to 2m with indumentum of soft stellate hairs *H. oblongata*
- 52. Carpels (4)5, or 10–15
 - 60. Carpels glabrous
 - 61. Leaves thin, flat, not spine-tipped
 - 62. Leaves silky, silvery, narrow, tapered towards the base.
 - Flowers often clustered *H. potentilliflora*
 - 62. Leaves glabrous, green, broad, or if narrow then stem-clasping at base. Flowers usually single
 - 63. Leaves perfoliate (ie leaf completely surrounding stem) *H. perfoliata*
 - 63. Leaves amplexicaul (stem-clasping at their base)
 - 64. Leaves broadly elliptic to circular *H. porongurupensis*
 - 64. Leaves ovate or very narrowly ovate to linear
 - 65. Leaves very narrowly ovate to linear *H. cunninghamii*
 - 65. Leaves ovate to narrowly ovate *H. amplexicaulis*
 - 61. Leaves thick with recurved margins, spine-tipped *H. exasperata* group
 - 60. Carpels hairy
 - 66. Carpels 5–15 (usually 10). Leaves with 5–10 pairs of teeth.
 - Bract one, narrow *H. grossulariifolia*
 - 66. Carpels (4)5. Leaves entire or with 1–3 pairs of teeth. Bracts several, dark, broad and papery
 - 67. Erect to sprawling plant. Leaves narrowly oblong, densely hairy with spreading hairs, margin entire or with very occasional teeth. Flowers 20–35 mm in diameter *H. montana*
 - 67. Sprawling plant. Leaves obovate to elliptic, with dense tiny erect hairs and a few longer spreading hairs, margin with 1–3 pairs of teeth. Flowers 40–65 mm in diameter long-stalked *H. lasiopus*
 - 51. Flowers sessile or almost so
 - 68. Carpels glabrous
 - 69. Carpels 5
 - 70. Leaf tip pungent *H. exasperata* group
 - 70. Leaf not pungent *H. lividula*
 - 69. Carpels (2)3
 - 71. Sepals glabrous or almost so, but sometimes margin ciliolate
 - 72. Stamens numerous, more than 30. Leaves with long straight hairs *H. mylnei*
 - 72. Stamens 10–20. Leaves glabrous or with short curled hairs
 - 73. Leaves with curled white hairs *H. inclusa*
 - 73. Leaves glabrous
 - 74. Leaves thin, flat, ovate to elliptic, narrowly obovate or narrowly oblong, 6–15 mm long. Flowers sessile
 - 75. Leaves dimorphic, basal leaves much longer and narrower than the ovate to elliptic floral leaves *H. glomerata* subsp. *glomerata*
 - 75. Leaves all similar in size and shape, narrowly obovate to narrowly oblong

- 76. Sepals apiculate. Leaves narrowly obovate **H. glomerata** subsp. **wandoo**
- 76. Sepals obtuse. Leaves narrowly oblong **H. glomerata** subsp. **darlingensis**
- 74. Leaves thick with margin revolute to the midrib, narrowly oblong. Flowers on very short stalks **H. glabriuscula**
- 71. Sepals hairy
 - 77. Hairs on calyx golden brown **H. drummondii**
 - 77. Hairs on calyx white to grey
 - 78. Leaves 2–6 mm long, thick, with margin revolute to the midrib **H. glabriuscula**
 - 78. Leaves 5–50 mm long, thin, flat
 - 79. Leaves entire
 - 80. Leaves silvery **H. argentea**
 - 80. Leaves green to bluish green or grey-green
 - 81. Hairs on sepals dense, appressed **H. commutata**
 - 81. Hairs on sepals few and strong, spreading, conspicuous **H. pilosa**
 - 79. Leaves toothed
 - 82. Leaves with only 1–3 teeth each side **H. pilosa**
 - 82. Leaves with several teeth each side
 - 83. Teeth of leaves serrate **H. serrata**
 - 83. Teeth of leaves crenate **H. serrata** (Darling Range variant)
- 68. Carpels hairy
 - 84. Leaves spine-tipped. Carpels stellate-hairy, 6–10-ovulate.
Bracts inconspicuous, leaf-like
 - 85. Leaves straight, 10–20 mm long. Sepals 12–16 mm long.
Carpels (2)3 with (8)10 ovules **H. graniticola**
 - 85. Leaves curved, 4–8 mm long. Sepals 5–9 mm long.
Carpels 2 with 6–8 ovules **H. arcuata**
 - 84. Leaves obtuse to acute, not spine-tipped. Carpels with simple hairs,
2-ovulate. Bracts conspicuous, black and papery
 - 86. Flowers orange
 - 87. Petals broad. Anthers yellow or black, obovate, more
than 0.5 mm wide. Carpels 5 **H. miniata**
 - 87. Petals distinctly narrowed at base. Anthers yellow, linear,
less than 0.5 mm wide. Carpels 3 **H. selkii**
 - 86. Flowers yellow
 - 88. Flowers sessile. Leaves obovate to elliptic, sometimes narrowly so. Carpels 3–5
 - 89. Carpels 3 or 4. Sepals with very closely appressed hairs.
Flowers 15–25 mm across **H. ovata**
 - 89. Carpels 5. Sepals with more or less appressed hairs. Flowers 30–65 mm across
 - 90. Leaves narrowly elliptic to elliptic **H. miniata**
 - 90. Leaves obovate-elliptic **H. quadricolor**
 - 88. Some flowers at least shortly stalked particularly in fruit. Leaves
oblong. Carpels 4 or 5 **H. montana**
- 50. Stamens fused into fascicles, occasionally also with a few single stamens
 - 91. Carpels 3
 - 92. Flowers on slender stalks
 - 93. Leaves flat or with somewhat recurved margins
 - 94. Erect or weeping shrub 0.5–1.5 m high. Leaves with
short curled hairs **H. racemosa** (Dongara variant)
 - 94. Prostrate or sprawling shrub. Leaves glabrous or with straight hairs **H. racemosa**

93. Leaves sub-terete, glabrous **H. hibbertioides** var. **pedunculata**
92. Flowers sessile or almost so
95. Leaf surface glabrous or almost so, margins conspicuously fringed in *H. vaginata*
96. Bracts conspicuous, broad, often fairly rigid or chartaceous
97. Apex of sepals acute **H. notibractea**
97. Apex of sepals obtuse to emarginate
98. Leaves terete to semi-terete, tipped by tiny curled hairs **H. acrotrichion**
98. Leaves flat, glabrous
99. Stamens 2.5–4 mm long, anthers oblong to elliptic and apiculate **H. chartacea**
99. Stamens 1.5–2.5 mm long, anthers oblong to obovate and obtuse to truncate
100. Bracts more or less circular, 2–3 mm wide, obtuse or apiculate **H. pulchra** var. **pulchra**
100. Bracts ovate to elliptic, 1–1.3 mm wide, more or less acute **H. pulchra** var. **acutibractea**
96. Bracts inconspicuous, not rigid or chartaceous
101. Leaf margins closely revolute to midrib so that lower leaf surface appears 2-grooved, the leaf tip recurved
102. Leaves linear and straight **H. rupicola**
102. Leaves very narrowly triangular, and somewhat sigmoid **H. hamata**
101. Leaves terete, thick with somewhat recurved margins or flat, but not with margins revolute to midrib
103. Leaves flat or flattened, not terete
104. Floral and stem leaves different, stem leaves narrow; floral leaves broader ovate to elliptic
105. Leaf margins long-fringed. Floral leaves 15–20 mm long. Flowers 15–30 mm in diameter **H. vaginata**
105. Leaf margins entire or very minutely ciliate. Floral leaves 3.5–10 mm long. Flowers 8–15 mm in diameter **H. glomerata** subsp. **ginginensis**
104. Floral and stem leaves all similar, narrow
106. Stamens 15–20. Sepals and leaf bases usually conspicuously fringed **H. sp. Warradage**
106. Stamens 8–12. Sepals and leaf bases glabrous
107. Leaves dilated and somewhat stem-clasping at base, narrowly oblong to linear **H. subvaginata**
107. Leaves not dilated at base not or scarcely stem-clasping, oblong to narrowly oblong
108. Leaves oblong to elliptic, thin, truncate, often with minutely recurved centre, midrib not enlarged and blade broad
109. Leaves oblong to oblong-elliptic **H. glomerata** subsp. **darlingensis**
109. Leaves ovate to elliptic, occasionally with elongated basal leaves **H. glomerata** subsp. **ginginensis**
108. Leaves linear, thick, apex obtuse, lower surface with much enlarged midrib and with very narrow blade **H. pulchra** var. **crassinervia**
103. Leaves slender, more or less terete, usually tapered towards tip
110. Sepals obtuse or with very small soft point
111. Leaves 3–12 mm long. Staminal filaments of fascicles, fused for two-thirds their length **H. hemignosta**

- 111. Leaves 10–22 mm long. Staminal filaments fused for up to half their length **H. hibbertioides** var. **meridionalis**
- 110. Sepals with conspicuous soft awn-like tip **H. hibbertioides** var. **hibbertioides**
- 95. Leaves hairy, at least towards the base, not glabrous with a conspicuously fringed margin
- 112. Sepals glabrous or with sparse hairs only
- 113. Bracts inconspicuous. Sepals obtuse to subacute
- 114. Leaves alternate, not clustered, oblong-elliptic **H. priceana**
- 114. Leaves clustered, linear
- 115. Anthers narrowly oblong, 1–2 mm long. Sepals obtuse **H. desmophylla**
- 115. Anthers narrowly obovate, 0.7–0.8 mm long. Sepals obtuse to sub-acute **H. helianthemoides**
- 113. Bracts conspicuous. Sepals acute
- 116. Leaves with a short blunt mucro. Bracts narrowly triangular **H. fitzgeraldensis**
- 116. Leaves obtuse. Bracts broadly elliptic, rigid **H. notibractea**
- 112. Sepals with dense silky hairs
- 117. Leaves flat or only very slightly recurved margins. Stamens 11 in 3 fascicles each of 3 stamens and 2 single stamens **H. trichocalyx**
- 117. Leaves with recurved margins. Stamens 25–30 in 5 fascicles each of 4–6 stamens **H. sp. Gnangara**
- 91. Carpels 5
- 118. Leaves spine-tipped **H. exasperata** group
- 118. Leaves not spine-tipped, sometimes with a soft point
- 119. Leaves flat or with slightly recurved margins
- 120. Sepals glabrous
- 121. Leaves broad, obovate to elliptic, 20–30 mm long, entire or distantly and shallowly toothed. Stamens 15–25. Bracts absent or inconspicuous **H. cuneiformis**
- 121. Leaves narrowly oblong, entire, 15–20 mm long. Stamens 15. Flowers surrounded by 2 or 3 conspicuous bracts **H. glabrisepala**
- 120. Sepals with dense long hairs
- 122. Leaves more or less glabrous. Sepals with long pilose hairs only **H. glomerosa** var. **glomerosa**
- 122. Leaves shortly felted. Sepals with short and long hairs .. **H. glomerosa** var. **bistrata**
- 119. Leaves with strongly recurved margins
- 123. Sepals silky-hairy with brownish hairs. Bracts conspicuous **H. ferruginea**
- 123. Sepals glabrous or thinly hairy with white to grey hairs. Bracts inconspicuous
- 124. Leaves with terminal tuft of hairs. Sepals 3.5–6 mm long, shortly acute **H. depressa**
- 124. Leaves lacking terminal hair tuft. Sepals 6–17 mm long, long-acute
- 125. Leaves glabrous. Sepals 10–17 mm long **H. huegelii**
- 125. Leaves densely hairy. Sepals 6–12 mm long **H. pachyrrhiza**

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Short communications

Recognition of *Eucalyptus quaerenda* (Myrtaceae) at specific rank

Phylogenetic analysis of the relationships between the taxa in the *Eucalyptus angustissima* complex have been investigated using RFLP analysis of nuclear genome (Elliott and Byrne 2003) (Voucher specimens at PERTH: W. O'Sullivan 127, 357, 812, 968, 966, 1183, 1190, 1193, 1194). This study assessed populations of *E. angustissima* subsp. *angustissima*, *E. angustissima* subsp. *quaerenda*, *E. foliosa* and *E. misella* and found all four taxa to be genetically distinct. *Eucalyptus angustissima* was not monophyletic as the two subspecies did not cluster together. *Eucalyptus misella* was sister species to *E. angustissima* subsp. *angustissima*, and *E. foliosa* was sister species to both these taxa. *Eucalyptus angustissima* subsp. *quaerenda* was the most distinct of the four taxa. This level of genetic differentiation between *E. angustissima* subsp. *quaerenda* and *E. angustissima* subsp. *angustissima* warrants the elevation of *E. angustissima* subsp. *quaerenda* to species rank.

The genetic study also assessed a population from north-west of Ravensthorpe, currently identified as *E. angustissima* subsp. *quaerenda* (D. Nicolle pers. com.), but previously referred to as an intergrade between *E. angustissima* subsp. *quaerenda* and *E. angustissima* subsp. *angustissima*. This population showed greatest genetic affinities with *E. angustissima* subsp. *quaerenda* and the level of genetic similarity between this population and *E. angustissima* subsp. *quaerenda* was higher than the genetic similarity among *E. angustissima* subsp. *angustissima* populations (Elliott & Byrne 2004). The genetic analysis is consistent with the identification of this population as *E. angustissima* subsp. *quaerenda*. Recognition of this population marks a substantial range expansion for *E. angustissima* subsp. *quaerenda* as it occurs in the upper reaches of the Phillips River approximately 100 km east of the previous recorded location around Lake Chinocup. Specimens identified as *E. angustissima* subsp. *quaerenda* have also been recorded from the western shores of Lake King.

Recognition of *E. angustissima* subsp. *quaerenda* as *E. quaerenda* is made here. All other detail and description of the taxon remain as previously published (Hill & Johnson 1992) except for the increase in distribution reported here and recognition of the intergrade population of Hill and Johnson (1992) as *E. quaerenda*.

Eucalyptus quaerenda (L.A.S. Johnson & K.D. Hill) Byrne, *comb. et stat. nov.*

Eucalyptus angustissima F. Muell. subsp. *quaerenda* L.A.S. Johnson & K.D. Hill, *Telopea* 4:598–599. – *Type*: 100m S of the south shore of Lake Chinocup [Chinocup] WA, 13 November 1986 K.D. Hill, L.A.S. Johnson & D.F. Blaxell KH2460 (*holo*: NSW; *iso*: CANB, CBG, MEL, PERTH).

Distribution: Southern and western shores of Lake Chinocup and Lake Altham, the upper reaches of the Phillips River and around the western shores of Lake King (Figure 1).

Conservation Status: Conservation Codes for Western Australian Flora: Priority Three. Known from less than 5 populations, at least one in a Nature Reserve (Chinocup Nature Reserve).

Selected specimens: 3.1 km from highway along Fitzgerald road, NW of Ravensthorpe, on upper Phillips River branch [c. 39 km SSE of Lake King], 18 Jan. 1985, M.I.H. Brooker 8807 (PERTH); 18 miles SE of Lake King township, 25 Feb. 1966, S.G.M. Carr & A.S. George ASG 7674 (CANB, K,

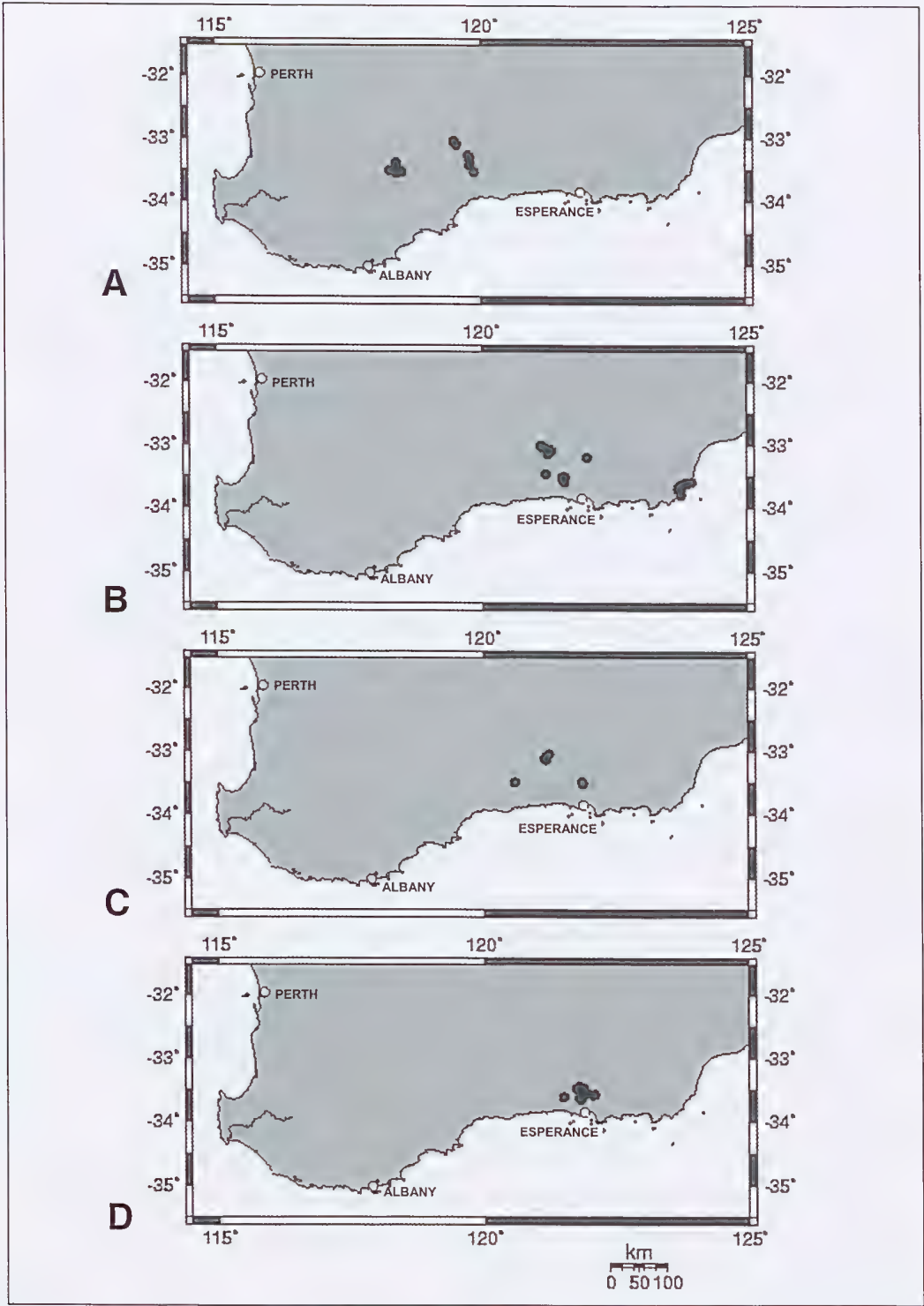


Figure 1. Distributions of A) *E. quaerenda*, B) *E. angustissima*, C) *E. misella* and D) *E. foliosa* in south-west Western Australia. Distribution data obtained from FloraBase (Western Australian Herbarium, 1998) on 1 June 2004.

PERTH); Lake King - Ravensthorpe road, 2.9 km N of Hatters Hill road, private property - Helen Brownley's Farm, 9 Oct. 1996, *W. O'Sullivan* WOS 130 (PERTH); Phillips River crossing, W side of Long Creek Road, 10 Oct. 1996, *W. O'Sullivan* WOS 162 (PERTH); SW of Lake Chinocup, 9 Jun. 2000, *W. O'Sullivan* WOS 968 (AD, CANB, PERTH); W of Pingrup, Jan. 1953, *J. Reeves* 146 (PERTH); c. 3.5 km N of Rasmussen Road, NW of Lake Altham, 18 Sep. 1998, *P. White* PJW 1164 (PERTH); c. 6 km N of Lake Grace - Lake King Road along Hewson Road, 800 m SE of Hewson Road in paddock, 5 Jun. 2002, *P.J. White* 1279 (AD, PERTH).

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Correction of type locality and flowering time for *Melaleuca apostiba* (Myrtaceae)

Melaleuca apostiba K.J. Cowley was described from a specimen collected by R. Morland during a Lands & Surveys Department expedition to the Officer Basin in 1963. The holotype of *M. apostiba* has the collecting number M10, with the label recording the locality as 'between Carnegie and Giles' and the collection date as June 1963.

From files held by the Western Australian Department for Planning and Infrastructure it was seen that the complete expedition route was: Perth–Wiluna–Carnegie–Giles–Blackstone–Warburton–Cosmo Newbery–Laverton–Neale Junction–Endeavour Bore–Forrest–Madura–Cocklebidy–Haig–Rawlinna–Zanthus–Cundeelee–Queen Victoria Spring–Zanthus–Kalgoorlie–Perth. Letters planning the trip showed that the expedition expected to leave Perth on 14 October 1963 and Leonora on 16 October. Telegrams advising of progress showed that the expedition left Carnegie on 22 October were delayed due to a broken truck spring on 24 October and arrived at Giles on 28 October. On 8 November the party was 50 miles [80 km] south of Neale Junction and expected to arrive at Rawlinna on 10 November. On 13 November they expected to complete the survey and reach Perth on 15 November 1963.

The 42 specimens that PERTH holds from the expedition each have collecting numbers with a letter between "A" and "S" and a number and when they are put in alphabetical and numerical order, they correspond with a list in the files (entitled Appendix E). When this list is compared with the diary of the trip, in which they recorded where samples were collected and their common names, it is possible to identify exact sites for many of the collections.

Specimens with the prefix "M" correspond with those collected just east of Cosmo Newbery on the Warburton road; this locality accords well with the 3 other collections of *M. apostiba* held at PERTH. The date of collection would have been in the first week of November.

Records at PERTH for the holotype of *Melaleuca apostiba* have been revised to: 'Locality: 7.3 miles (11.7 km) east of Cosmo Newbery on the Warburton Road. Collection date: November 1963'.

Acknowledgements

With thanks to Carolyn Leach at the Department of Land Information library and Beng Siew Mahon at the CALM Herbarium library.

Reference

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A first report of the exotic *Leptochloa panicea* subsp. *brachiata* (Poaceae) for Western Australia

The genus *Leptochloa* P. Beauv. (Poaceae) is represented by nine species in Australia (Sharp and Simon 2002). Three of these include subspecies, bringing the total number of taxa in Australia to fourteen. I report here the first confirmed occurrence in Western Australia of *Leptochloa panicea* (Retz.) Ohwi subsp. *brachiata* (Steud.) N. Snow, a non-native taxon of neotropical origin. The species has various common names, including red sprangletop, mucronate sprangletop, as well as several variations in Spanish (Snow 1997).

This taxon is probably the most abundant member of the genus in the New World tropics and warm temperate zones, if the total number of herbarium specimens is an accurate reflection of its overall abundance. Apart from *L. fusca* (L.) Kunth subsp. *fascicularis* (Lam.) N. Snow and subsp. *uninervia* (J. Presl) N. Snow, it has the widest distribution of the genus in the neotropics. Previously for Australia, *L. panicea* subsp. *brachiata* has only been reported from several occurrences in or near coastal Queensland (Sharp and Simon 2002).

Many members of *Leptochloa* thrive in disturbed, seasonally moist habitats, such as along the receding margins of reservoirs, on mesic or irrigated cultivated and livestock lands, along seasonal watercourses (Snow & Peterson 1992) or floodplains, and along roadways. This first report is from a specimen along the banks of Lake Kununurra. The specimen seen at GREE is atypical in its having only a very few pilose hairs on the leaf sheaths, whereas typical members of the species and subspecies typically have numerous (although typically not abundant) pilose hairs.

Leptochloa panicea subsp. *brachiata* has the potential to become a widespread weed in Australia since virtually any part of the continent under 1,000 metres elevation combining seasonal moisture and a disturbed soil surface represents potential habitat. Given the cooler climatic regime of Tasmania, it is less likely it would become established there. This taxon, which recently also has been known by the names *Leptochloa mucronata* (Lam.) P. Beauv. and *L. filiformis* (Michx.) Kunth (Snow and Davidse 1993; Snow 1998), can be found on checklists on the internet of species considered to be weedy threats to the viticulture industry of WA (e.g. <http://agspsrv34.agric.wa.gov.au/programs/app/industry/links/pdf/WTST.pdf>.) Another neotropical member of the genus, *L. fusca* subsp. *uninervia*, is also considered a threat to the vineyards in WA and becoming increasingly widespread in Australia (Snow and Simon 1999; Sharp and Simon 2002).

Specimen cited: WESTERN AUSTRALIA: Packsaddle Plain on the bank of Lake Kununurra, 7.3 km from Kununurra on a bearing of 182 degrees, E. Kimberley, 90°43'59"S, 128°44'17"E, 18 Apr 2000, A. A. Mitchell 6158 (BO, BRI, GREE!, PERTH).

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Nomenclatural notes on two species of *Hibbertia* (Dilleniaceae)

Examination of type material of *Hibbertia rhadinopoda* and closely related taxa has revealed that there is an earlier name for *H. rhadinopoda* in the genus *Pleurandra* Labill. The necessary new combination is made here. A lectotype is also chosen for *Hibbertia inclusa*.

Hibbertia diamesogenos (Steud.) J.R. Wheeler, *comb. nov.*

Pleurandra diamesogenos Steud., Pl. Preiss. 1: 265 (1845). – *Hibbertia lineata* var. *parviflora* Benth., Fl. Austral. 1: 24 (1863), based on *P. diamesogenos*. Type: “in turfosis sylvaticis districtus Sussex” [Busselton area, Western Australia], 17 December 1839, Preiss 2141 (holo: LD; iso: MEL 666864, 666877).

Hibbertia rhadinopoda F. Muell., Fragm. Phyt. Austral. 11: 91 (1880). Type: “in pratis fertilioribus ad flumen Harvey’s River” [Harvey River, Western Australia], F. Mueller (holo: MEL 1010265, 1010266).

Hibbertia kochii Maiden & E. Betche, Proc. Linn. Soc. New South Wales 38: 243 (1913). Type: Lowden, Western Australia, October 1909, M. Koch (holo: NSW).

Distribution. Recorded from north of Mogumber to Margaret River and inland to west of Kojonup.

Notes. *Hibbertia diamesogenos* is very variable as to stature, leaf size and flower size. A suite of specimens of this species from the Collie area has particularly small flowers which most closely match the type material of *Hibbertia kochii* Maiden & Betche. Maiden & Betche (1913) note a prostrate, almost glabrous variant occurring in the same area as the type specimen. I have seen similar material, some even with glabrous or almost glabrous carpels (from between Dunsborough and Margaret River), which are in all other respects typical of *Hibbertia diamesogenos*.

Degree of hairiness of leaves and sepals is very variable. Specimens from the southern part of its distribution are commonly very hairy with long straight simple hairs and a few short uncinata hairs. Specimens from further north around Perth, are frequently less hairy, sometimes almost glabrous or with few if any of the long straight hairs that are seen on the southern specimens. However, there are a considerable number of sparsely hairy specimens from the southern part of the distribution range, e.g. Collie and the Margaret River area.

Typically specimens have 2 or 3 staminodes each side of the stamens, however, these are not evident on all collections examined. Staminodes are commonly absent from collections north of Pinjarra and are also occasionally absent from more southern collections.

Although *Hibbertia diamesogenos* exhibits considerable variation there do not appear to be any clear characters on which to separate the species into infraspecific taxa.

Hibbertia inclusa Benth., Fl. Austral. 1: 34 (1863). *Type*: Swan River, [Western Australia], *J. Drummond* n. 13 (*lecto*: K, here designated).

Notes. The only sheet seen of *Drummond* 13 which agrees with the type description is in herb. K which is marked with the loan details "978 85 - 12" and is stamped "Herbarium Hookerianum".

Other sheets seen of *Drummond* 13 are: LD 85/62-2499 (= *H. grossulariifolia* (Salisb.) Salisb.), LD 85/2502 (= *H. porongurupensis* J.R. Wheeler & R.D. Hoogland) and MEL 666860 (= *H. diamesogenos* (Steud.) J.R. Wheeler). The plant specimens on these sheets do not match the type description of *Hibbertia inclusa*.

Acknowledgements

I should like to thank the Director and staff of the Western Australian Herbarium for access to the State collection. I thank also the directors of K, LD, MEL and NSW for the loan of type material.

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Corrections to Nuytsia 15(1)

On page 43, the PERTH sheet number for one the isotypes of the newly described *Pileanthus septentrionalis* Keighery had two numbers transposed. The correct sheet number is PERTH 02504286.

On page 44, the species epithet for the new *Pileanthus* there described was misspelt. The taxon name is correctly spelt as *Pileanthus aurantiacus* Keighery. This spelling correction should also be noted on page 37, in the key on page 39 and in captions for figures 3 and 4 (pages 45 and 47 respectively). On page 46 the misspelt term is incorrectly attributed as derived from Greek, when *aurantiacus* is the well-used Latin term to connote orange colour.

On page 50, the epithet for the new subspecies of *Pileanthus peduncularis* there described was misspelt. The subspecific epithet should be correctly spelt as subsp. *pilifer*, to agree with the generic masculine gender. This spelling correction should also be noted in the abstract (page 37), the caption for figure 4 (page 47), and the key (page 50).

On page 96, the species epithet for the new *Grevillea* there described was misspelt. The taxon name is correctly spelt as *Grevillea squiresiae* P.Olde & N.Marriott. This orthographic correction should also be noted in the abstract and introduction on page 85, in the keys on page 92, in the caption for figure 3 (page 97) and in the discussion of affinity (page 98).

On page 139, within the Abstract, the part number in the literature reference should be 15(1) and not 15(2).

On page 139, the PERTH sheet number for the holotype of the newly described *Hibbertia ancistrophylla* J.R. Wheeler was incorrectly cited. The correct sheet number is PERTH 06130526.

On page 143, the PERTH sheet number for the holotype of the newly described *Hibbertia ancistrotricha* J.R. Wheeler was incorrectly cited. The correct sheet number is PERTH 06130518.

The correction of the publication date for Nuytsia 13(3) was given on page 155 of Volume 15 as 8 January 2002, but should in fact have been cited as 8 January 2001, as given in the Cumulative Index to Volume 13.

CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA

R: Declared Rare Flora – Extant Taxa (= Threatened Flora = Endangered + Vulnerable)

Taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Threatened Species Scientific Committee.

X: Declared Rare Flora – Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for Environment, after recommendation by the State's threatened Species Scientific Committee.

1: Priority One – Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two – Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three – Poorly Known Taxa

Taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.

4: Priority Four – Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.

Two new species of *Dampiera* (Goodeniaceae)
from the Pilbara region, Western Australia
By B.J. Lepschi, M.E. Trudgen and S.J. van Leeuwen
269

A review of *Hibbertia hemignosta* and its allies (Dilleniaceae)
from Western Australia
By J.R. Wheeler
277

Miscellaneous new *Hibbertia* species (Dilleniaceae) from
the south coast and adjacent interior of Western Australia
By J.R. Wheeler
299

An interim key to the Western Australian species of *Hibbertia*
(Dilleniaceae)
By J.R. Wheeler
311

Short communications

Recognition of *Eucalyptus quaerenda* at specific rank
By M. Byrne
321

Correction of type locality and flowering time
for *Melaleuca apostiba* (Myrtaceae)
By M. Lewington
324

A first report of *Leptochloa panicea* subsp. *brachiata* (Poaceae)
from Western Australia
By Neil Snow
325

Nomenclatural notes on two species of *Hibbertia* (Dilleniaceae)
By J.R. Wheeler
327

Other contents

Corrections to Nuytsia Volume 15 Number 1
329

Conservation Codes for Western Australian Flora
330

Publication date for Nuytsia Volume 15 Number 1
330

CONTENTS

Main papers

Eucalyptus conglobata subsp. *perata* (Myrtaceae), a new taxon from southern Western Australia and notes on

E. series Rufispermae

By M.I.H. Brooker and A.V. Slee

157

New species and lectotypifications of some reticulate-nerved *Tephrosia* (Fabaceae) from north-west Australia and the genus *Paratephrosia* re-evaluated

By I.D. Cowie

163

Grevillea bipinnatifida subsp. *pagna* (Proteaceae), a new subspecies from south-west Western Australia

By R.J. Cranfield

187

Lichen Census of Western Australia

By R.J. Cranfield

193

Two new species of *Ptilotus* (Amaranthaceae) from Western Australia

By R.W. Davis

221

Eucalyptus virginea and *E. relicta* (Myrtaceae), two new rare forest trees from south-western Australia allied to

E. lane-poolei, and a new phantom hybrid

By S.D. Hopper and G. Wardell-Johnson

227

A new species of *Bulbine* (Asphodelaceae) from Western Australia

By G.J. Keighery

241

A taxonomic review of the genus *Agrostocrinum* (Phormiaceae)

By G.J. Keighery

245

Taxonomic notes on the *Angianthus drummondii* complex (Asteraceae: Gnaphaliinae)

By G.J. Keighery

253

Taxonomy of the *Calytrix ecalycata* complex (Myrtaceae)

By G.J. Keighery

261

(Contents continued inside back cover)

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